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ENGINEERING
INDUSTRIES

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The Late Mr Durga Prasad Khaitan Founder of
The Engineering Association of India

PREFACE

This publication which gives an account of the rise and growth of various Engineering and allied Industries in India is intended to present to the Government and the public the progress achieved by these industries. To achieve this it has to be built up gradually in the light of the experience gained in the preceding year. Constant revision is necessary to make it useful to those interested in Engineering Industry both in India and abroad.

The last edition of this publication met with support from Chambers of Commerce, Industrial Associations, manufacturers, Central and Provincial Governments and their Supply Departments, retail and wholesale dealers, Contractors and Engineers.

The daily enquiries received by telephone, verbally or in writing by the Secretary of the Association for names and addresses of the members able to supply the various engineering goods indicated the desirability of adding three more sections to the volume. (1) Names and addresses. (2) Trade Marks and Patents. (3) Buyer's Guide. Quite a number of factories till recently engaged in essential war production have already switched on to articles of civil consumption and the public would like to know what among them, formerly imported from foreign countries can be supplied by Indian firms.

This edition of the 'Indian Engineering Industries' is, therefore, presented to the members and to the public in the hope that it will meet a need of the time and help in building up a market for Indian Engineering Industries by enabling buyers in India and abroad to form trade connections with Indian Manufacturers.

By Authority.



Darab Cursetji Driver

President

Engineering Association of India

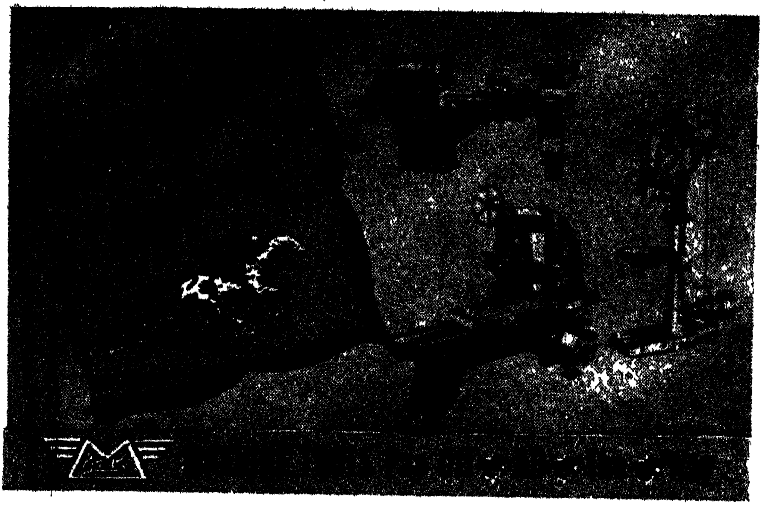
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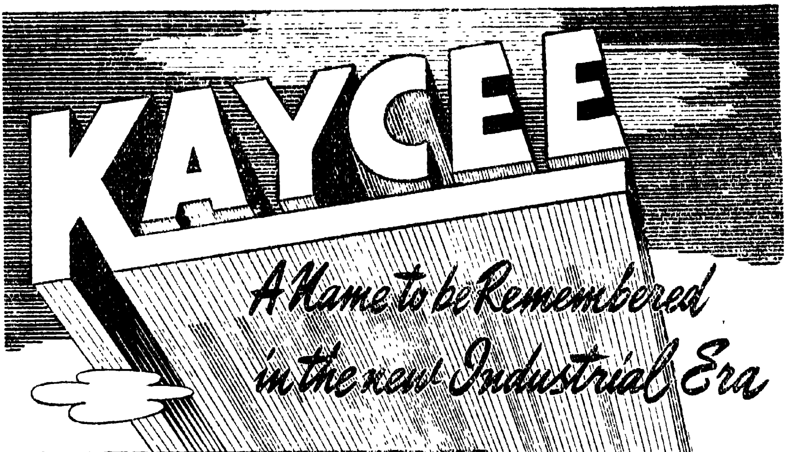
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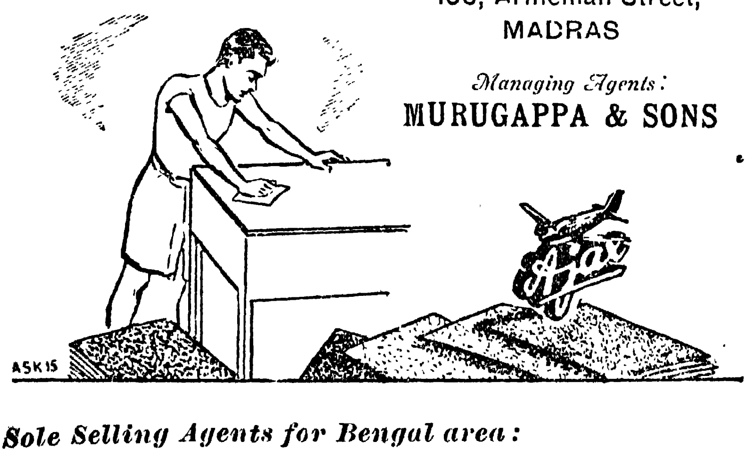
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KAYCEE
A Name to be Remembered in the new Industrial Era









Binay Krishna Rohatgi

President

Engineering Association of India

ACTIVITIES

OF

The Engineering Association of India

WHAT IS THE ENGINEERING ASSOCIATION OF INDIA

THE OBJECT of the **Association** is to encourage and develop Indian Engineering and allied industries and to safe-guard the interests of Indian manufacturers. Nothing that concerns the welfare of the industry falls outside the scope of the Association's interests.

The Engineering Association of India was founded in March, 1942 at the initiative of the late **Mr. Durga Prasad Khaitan** who more than anybody else realised the impact of war on engineering industries in India and the necessity of an all India organisation to combat the various problems facing Indian Industrialists.

The growth of the Association considering that it has just entered the 5th year of its life—a period too short in the life of an institution—has been remarkable and its membership now comprises of 162 firms engaged in various engineering and allied industries.

The Engineering Association of India is affiliated to the Indian Chamber of Commerce, Calcutta, which is accepted by all, the press, the public and the legislature to be one of the premier organisations of Indian business and industrial interests. The Engineering Association of India is a member of the Federation of Indian Chambers of Commerce and Industry which is the premier most body representing Indian commerce and industry; the Engineering Association of India is also a member of the All-India Organisation of Industrial Employers which concerns itself with all aspects of labour.

Constitutionally it is a voluntary association of engineering firms for the promotion of their several and mutual interests and it is governed by a Committee of 11 elected and 5 co-opted from amongst its members.

WHAT DOES THE ENGINEERING ASSOCIATION DO

BROADLY, its activities have developed along two lines. It renders service to the industry as a whole in its dealings with the Government and other interests, and it renders to individual firms a thousand and one private services in representing their cases to Government in securing their raw materials and orders for their manufactured goods, in helping them to know the sources of supply of their requirements etc., etc.

Co-operatively it expresses the views of engineering industrialists on a vast number of questions such as industrial legislation, factory Acts, tariffs, taxation, artisan training and technical education etc., etc.

The existence of the Engineering Association of India enables the views of manufacturers of enginering and allied products throughout the country to be gathered together and presented to the proper quarter, with all the weight of an organised industry behind them. The Engineering Association of India refrains from purely destructive criticism, and attempts to contribute to the counsels of the nation the constructive views of producers in our industry, upon whom the country's welfare considerably depends. Such a function could not be carried out without the assistance of an organisation to collect and co-ordinate facts and opinions, and without a staff to sift and prepare them for presentation to legislature or the public.

The Right of Private Enterprise is one of the main planks of the Association's policy, and it co-operates with kindred organisations for the conservation of such rights and the advancement of the country's prosperity.

SERVICES

TO

INDIVIDUAL MEMBERS

(*Services covered by members' Subscriptions and offered without extra charge include the following*):

Adjudication.—The Association's officers appear before courts and other tribunals to safe-guard individual and collective interests of the members.

Award.—Copies of all awards are forwarded to members gratis immediately upon publication.

Advisings.—The Association's staff is always available to advise on any difficulties arising out of the multitudinous acts, regulations and awards concerning the engineering and allied industries. Personal assistance is given in the factories regarding questions of labour disputes and necessary procedures to comply with various industrial regulations.

Customers.—The Association receives frequently trade enquiries from prospective buyers and introduces them to the members.

Customs duties.—The Association's staff gives assistance in all questions relating to customs duties. Statistics are kept as far as possible both of local and foreign trade and information can always be supplied on request.

Enquiries for goods.—If the product you are looking for is not to be found in the Buyer's Guide secton the Association will find out who makes it.

Foreign Trade.—Members are advised regarding rules and regulations imposed by provincial and central Governments in export and import trades. Prospects in foreign countries for the goods manufactured are also examined. Sources of availability of foreign materials required by members are also supplied on request.

Inter Trading.—The Association pays every attention for facilitating inter-trade amongst the members.

Introduction.—Letters of introduction to organisations or individuals which may be helpful are supplied to representatives of members when required.

Labour information.—Elaborate statistics and information concerning wages and labour conditions in India and other countries are maintained and are available for the use of the members.

Library.—The Association's library contains technical books, periodicals and journals which can be had on loan or consulted by members.

Legal Advice.—The Association's staff is always available for advice in connection with difficulties regarding industrial laws.

Parliamentary Activities.—All bills introduced into the central or Provincial Assemblies are carefully studied by the Engineering Association of India and if necessary appropriate representations are made to the Government.

Government Regulations.—These regulations are carefully studied and the Association office keeps constantly in touch with fresh regulations imposed and with the modifications of old ones with a view to safeguarding the interests of the members and for the purpose of acquainting them with the obligations they are under.

Publications.—In addition to frequent publications on technical matters, labour problems etc. the Engineering Association of India issues fortnightly **'The Engineering News'** containing latest informations on industrial matters and items of general interest to the engineering and allied industries.

Renewed editions of the **'Indian Engineering Industries'** are issued every year.

Taxation.—The Association keeps constant watch and tries to protect the interests of the members against undue burden

of various kinds of taxes to make representation to Government and to advise members as to their legal responsibilities under various taxes and as to the latest departmental rulings.

Tariff Problems.—The Association gives advice and assistance in the preparation of memoranda or evidence for submission to the Tariff Board with a view to securing protection against foreign competition.

In addition to the above members' subscription also cover numerous other services rendered by the Association.

INTRODUCTION

The conclusion of hostilities with Japan in September 1945 marked the end of that catastrophe which had engulfed the whole world and gave rise to the problems of transition which necessarily occupy an important place in the industrial economy of the country. A change over from war economy, with its rigours of controls, its emphasis on the production of particular types of engineering stores for the requirements of the army, its diversion of the economic resources of the country from civilian to defence purposes, its mobilisation of the man-power of the country for war purposes and the manifold reactions which such measures produce in the economic life of the nation, to a peace time economy, is not an easy task.

The problems of transition that face the engineering industries are: immediate unemployment arising out of the stoppage or reduction of production of engineering factories previously working on a large scale to meet the demands of the army; change over of the engineering factories from defence to civilian use, the disposal of war time surpluses, their manner and time and their repercussion on our industries, the difficulty of adjusting costs which have increased owing to reduction in order to meet foreign competition with a tendency towards lowering of prices etc.

After the war broke out, India found herself deficient in many ingineering and allied industries for the manufacture of goods required by the army. The war gave a strong fillip to the existing engineering industries and gave rise to many new ones, and the cessation of hostilities meant stoppage of the demand from Government and the military for the products of these industries. The situation was further worsened by the irregular supply of important raw materials like iron and steel etc.

During the war almost all the engineering factories were under the control of the Director General of Munitions Production. The Government of India in many cases, in order to conserve currency and shipping space used to place bulk orders

in foreign countries and distribute the goods when they arrived in India. For example, in the field of Machine Tool industry, in the middle of the war, Government took over ordering of all the machine tools required for the country and their distribution. All orders for machine tools even those for industrial users were bulked together and contracted for by the Government. It was for rationalising production that the Government took up this burden on themselves. Licensing was introduced even for the manufacture of machine tools in the country. The system of bulk ordering was given up only in the early years of 1944 but the system of licensing continued even thereafter. Similarly, in order to ensure regular supply of electric fans and other kinds of electrical products, Government used to indent in bulk the components and the raw materials required by the Electrical Industry. The termination of the war put an end to these practices and the industrialists who had lost contact with the foreign suppliers found themselves in a difficult position. This has added to the difficulty of the reconversion problem.

Another important problem is the problem of disposal of wartime surpluses. India has been an important theatre of war and the United States Government have left property worth crores of rupees as war surplus for disposal. Similarly the property of His Majesty's Government and the Government of India are now being released in the country. The time and manner of disposal are greatly affecting the engineering industries.

During the war certain engineering industries had plans for new lines of production or expansion for their existing lines of activity. In the steel industry some of these have materialised during the last year. Tatas have now begun to manufacture electrical silicon sheets required by the electrical industries and at their sheet mills Tatas have taken to new lines of production. The Duplex Plant at the Steel Corporation of Bengal came into operation in the month of February 1946. The Mysore Iron and Steel Works have finally approved eight new schemes.

In the field of Machine Tool Industry the Machine Tool Control was abolished; the demand for them decreased from its wartime level with the result that many factories had to close down and re-organisation in the industry became necessary.

Various new engineering industries for example manufacture of electric motors and expanded metals etc. which had been planned during the war period began to operate early this year.

Last year the Government of India had appointed 29 industrial panels for investigating the present position and future lines of development of Indian industries. Out of these 29 panels about 14 were appointed to deal with the various engineering industries. These pertained to iron and steel large scale industries, iron and steel small scale industries like bolts, nuts and screws etc., non-ferrous metal industries, machine tools including small tools, plastics, ceramics, automobile and tractors, prime movers, ship-building and marine engineering, electrical machinery and equipment, industrial plant and machinery, light engineering industries, scientific instruments etc.

The reports of many of these panels have been submitted to the Government of India and their recommendations are being considered. The recommendations of these panels will have an important bearing on the future planning of Indian industries and it is in the context of these and other circumstances that the description of engineering and allied industries given in the following pages will be of interest to the readers.

The Government of India, in the month of November, 1945, appointed an Interim Tariff Board for investigating into the claims of Indian industries which had been started or developed during the wartime, for assistance and protection. Of the engineering industries referred to the Tariff Board, some have already been investigated into and reports submitted. The industries which have so far gone before the Tariff Board are: Aluminium, antimony, wood screws, machine tools, electric motors, beltings, steel belt furnacings, bicycle, steel hooks for baling.

The reports of the Tariff Board for various industries are before the Government of India for their consideration. This publication will survey the problems of various engineering industries and the necessity of protecting them in the future economy of the country.



Seth Ratanchand Hirachand

Chairman

Bombay Branch

(Director, Indian Hume Pipe Co., Ltd.)

We have also made an attempt to survey the various types of controls as they affect the engineering and allied industries. It will be recalled that during the war a number of controls were brought into operation for stepping up production, controlling prices and distribution of various commodities. In the context of conditions prevailing in the transition period, an effort has been made to indicate how far the existing controls affect our industries.

Part A deals with (1) Names and Addresses of the Engineering factories in the membership of the Association. (2) Their Trade Marks and Patents (3) a Buyer's Guide from which the public would know from where to obtain the requirements of engineering products and

Part B gives a survey of various engineering industries of the country.

Part C deals with the progress and development of individual member companies in the field of mechanical engineering, manufacture of machine tools, structural engineering, electrical engineering, ship-building and marine engineering, welding and press work.

INTRODUCTION

TO THE 1945 EDITION

The engineering industry in this country is only a few decades old; even the Tariff Board in 1925 could not assign a definite classification of the term "Engineering".

During the second half of the 19th century India's engineering industry was concerned mainly with the requirements of railway repairs. Towards the end of the century workshops were also established in response to the needs of the jute, tea, coal, cotton and other large scale industries. Early in this century the establishment of Tata Iron & Steel Works at Jamshedpur and its subsidiary industries in the neighbourhood opened the avenue for further progress during the last war.

From this historical background it will appear that the engineering industries have made a headway only recently and the rapid development of the industry on account of the present war gave rise to various problems and the necessity of having an all-India organisation of concerns interested in engineering and allied industries in India was soon felt. There already existed, since a long time, the Indian Engineering Association consisting of mainly European interests. In the circumstances, the grievances of Indian interests could not be attended to satisfactorily in the absence of an organised body. In order, therefore, to enable the Indian engineering concerns to co-operate in solving various problems facing the engineering industry and to put the view point of the Indian industry before the Government, and the public, this Association was started in March, 1942. The initiative for organising the Association was taken by the late Mr. Durga Prasad Khaitan, who, through his untiring effort and energy, made it possible for the Association to come into being. It was his enthusiasm, diligence and foresight that brought this Association into being and nursed it in its early months. We cherish the memory of the founder with gratitude and esteem.

This institution was started with a modest membership of 13 engineering concerns which has grown to 123 factories. The Association has been growing from strength to strength from

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Works: 2887

Telegrams: *Steel, Cawnpore.*

JAGJIT ENGINEERING WORKS.

Office:
& KAPURTHALA.
Works:

Telephone: 25
Telegrams: *Jagworks.*

J—*Contd.*

JAS. ALEXANDER & CO., LTD.

Office: 8, Dalhousie Square, East, CALCUTTA.
Works: 15, Watgunj Street, Kidderpore, CALCUTTA.
Telephone Office: Cal. 3016
Works: *South* 1401
Telegrams: *Jasalex.*

JAMNADAS BROTHERS.

Office: 69/4, Canning Street, CALCUTTA.
Temp. Add.
195/1, Harrison Road, CALCUTTA.
Telephone: *Howrah* 403
Telegrams: *Pooradam.*

THE JAMSHEDPUR ENG. & MACHINE MFG. CO., LTD.

Office: P. O. E. I. R. Works,
& Dist. Singhbhum,
Works: TATANAGAR, B.N.R.
Telephone: *Jamshedpur* 276
Telegrams: *Jemco, Tatanagar.*

JAY ENGINEERING WORKS LTD.

Office: 183A, Prince Anwarshah
& Road, P. O. Dhakuria,
Works: 24 PARGANAS
Telephone: *South* 2020
Telegrams: *Ushako, Calcutta.*

JAYANT METAL MFG. CO.

Office: 152, Lohar Chawl, BOMBAY.
17, Tara Chand Dutt St., CALCUTTA.
Works: Chinchpokli, BOMBAY.
Telephone: *Office*: 23919
Works: 42321
Cal. Office:
B.B. 6449
Telegrams: *Jayantbabu.*

J—*Contd.*

JEEWANLAL (1929) LTD.

Office: 101, Clive Street, CALCUTTA.

Works: G. T. Road, Belur, HOWRAH.

Telephone: *Office Cal.* 3323, 287

Telegrams: *Crownaluco, Calcutta.*

JYOTI LTD.

Office & *Works*: P. O. Alembic, BARODA.

Telephone: 287

Telegrams: *Jyot.*

K

KAMANI METALS & ALLOYS LTD.

Office: Kamani Chambers, Nicol Road, BOMBAY.

Works: Agra Road, Kurla (BOMBAY).

Telephone: 87156

Telegrams: *Alloys.*

KASSELS LTD.

Office: Subzi Mandi, DELHI.

Telephone: *Office*: 5813
Works: 6472

Telegrams: *Kassels.*

KAYCEE & CO., LTD.

Office: Lakshmi Mansions, P. O. Box No. 143, LAHORE.

Works: KARACHI, LAHORE & SHIKOHABAD (U.P.)

Telephone: 2317
2315

Telegrams: *Kayce.*

K—*Contd.*

KAYCEE GLASS WORKS LTD.

Office & *Works*: SHIKOHABAD, (U. P.)

Telegrams: *Kayce.*

KAYCEE INDUSTRIES LTD.

Office: The Mall, LAHORE.

Works: (at various places) & LAHORE.

Telephone: 2317
2315

Telegrams: *Kayce.*

KHEM CHAND RAJ KUMAR.

Office & *Works*: JULLUNDAR CITY.

Telephone: 295

Telegrams: *Rajkumar.*

KHIALI RAM GUJJAR MALL.

Office & *Works*: High Street, MONTGOMERY.

Telephone: 180

Telegrams: *Khialiram Gujjarmall.*

KIRLOSKAR BROS., LTD.

Office & *Works*: Kirloskarvadi, DIST. SATARA.

Telegrams: *Kirloskar.*

KRISHNALAL THIRANI & CO., LTD.

Office: 8, Royal Exchange Place, CALCUTTA.

Works: 46, Barrackpur Trunk Road, CALCUTTA.

Telephone: *Cal.* 4657

Telegrams: *Thiranico.*

K—*Contd.*

KUSHMIKA IRON WORKS LTD.

Office: 3, Maharshi Debendra Road, CALCUTTA.
Works: 70/73, Jeliapara Lane, Salkia, HOWRAH.
Telephone: *Office*: *B.B.* 4541
Works: *Howrah* 261
Telegrams: *Feracier.*

L

LUDHINA STEEL ROLLING MILLS.

Office & *Works*: Miller Gunj, LUDHIANA.
Telephone: 37

M

THE MACHINE MFG. CO., LTD.

Office & *Works*: Lillooah, HOWRAH.
Telephone: *Howrah* 477

THE MADRAS ENAMEL WORKS LTD.

Office & *Works*: 65, Sydenhams Road, MADRAS.
Telephone: 2646
Telegrams: *Enamelsign.*

MANTRI MACHINERY FACTORY LTD.

Office: 8, Royal Exchange Place, CALCUTTA.
Works: 8, Barracpore Trunk, Road, Kamarhatty, CALCUTTA.
Telephone: *Cal.* 5859
Telegrams: *Happyhome.*

M—*Contd.*

MAPARA PAREKH & CO.

Office & *Works*: Ghodbunder Road, Santakruz, P. O. Juhu, BOMBAY 25.
Telephone: 68202
Telegrams: *Simpsons.*

METAL PRESS WORKS LTD.

Office & *Works*: 156, Victoria Road, P. O. Baranagore, 24-PARGANAS.

METAL SPRAYING PRODUCTS.

Office: 119, Ripon Street, CALCUTTA.
Works: 4, Howrah Road, HOWRAH.
Telephone: Pk. 4150
Telegrams: *Metspray.*

METROPOLE WORKS.

Office & *Works*: Verka (AMRITSAR).
Telephone: 743
Telegrams: *Metropole.*

MUKAND IRON & STEEL WORKS LTD., (LAHORE)

Office & *Works*: Badamibagh, LAHORE.
Telephone: *Office*: 2828
Works: 2041
Telegrams: *'Jeewan', Lahore.*

M—*Contd.*

MUKAND IRON & STEEL WORKS LTD. (BOMBAY).

Office: Brick Bunder, BOMBAY.

Works: 51, Mohatma Gandhi Rd., FORT, BOMBAY.

Telephone: *Office*: 30027
Works: 46041

Telegrams: *Steel.*

THE MYSORE IRON & STEEL WORKS.

Office & Works: Bhadravati, SOUTH INDIA.

Telegrams: *Mysiron.*

THE MYSORE KIRLOSKAR LTD.

Office & Works: Harihar, MYSORE STATE.

Telegrams: *Mytools.*

THE MYSORE PREMIER METAL FACTORY.

Office: 124, Mint Street, G. T. MADRAS.

Works: Tondiarpet, MADRAS.

Telephone: 2535
Telegrams: *Sunbrand.*

N

NARAINDAS INDUSTRIES LTD.

Office & Works: 87-A, The Mall, LAHORE.

Telephone: 3066
Telegrams: *Narainstry.*

N—*Contd.*

NARAYAN ENGINEERING.

Office: 60A, Kali Krishna Tagore Street, CALCUTTA.

Works: 108-1, Benares Road, SALKIA (HOWRAH).

Telephone: *Office*: *B.B.* 1961
Works: *Howrah* 39

Telegrams: *Nature.*

THE NATIONAL IRON & STEEL CO., LTD.

Office: Stephen House, Dalhousie Square, CALCUTTA.

Works: P. O. Belur, HOWRAH.

Telephone: *Office*: *Cal.* 3194
Works: *How.* 670

Telegrams: *Niscoworks.*

THE NATIONAL INSULATED CABLE CO., OF INDIA LTD.

Office: 4, Dalhousie Square, EAST, CALCUTTA.

Works: Mehgaon C.P. Dist. JUBBULPORE.
Mulajore, *Via* Shamnagar, B. & A. RLY.

Telephone: *Office*: *Cal.* 5660 (10 Lines)

Telegrams: *Megohm.*

THE NATIONAL METAL INDUSTRIES LTD.

Office: 102A, Clive Street, CALCUTTA.

Works: 1, Bagzala Road, DUM DUM, CAL.

Telepkhone: *Office*: Cal. 6476 & 6477
Works: *Dum Dum* 5

Telegrams; *Nametal, Calcutta.*

N—*Contd.*

THE NATIONAL ROLLING MILLS LTD.

Office: Stephen House,
4, Dalhousie Square,
EAST, CALCUTTA.

Works: Mulajore *Via*,
Shamnagar,
B. & A. RLY.

Telephone: *Office*: *Cal.* 5660
(10 Lines)
Works: *Bhatpara*
32 & 33

Telegrams: *Megohm.*

THE NATIONAL SAND PAPER MILLS (INDIA) LTD.

Office:
& RAWALPINDI.
Works:

Telephone: 706
Telegrams: *Service.*

THE NATIONAL SCREW & WIRE PRODUCTS LTD.

Office: 4, Dalhousie Square,
CALCUTTA.

Works: P. O. Belur,
HOWRAH.

Telephone: *Office*: *Cal.* 3194
Works: *How.* 670

Telegrams: *Nasco.*

O

THE OGALE GLASS WORKS LTD.

Office:
& Ogalevadi,
Works: DIST. SATARA.

Telegrams: *'Glasworks'*
Ogalevadi.

O—*Contd.*

THE O. K. ELECTRIC WORKS LTD.

Office: G. P. O. Square,
The Mall,
LAHORE.

Works: Canal Park,
LAHORE.

Telephone: *Factory* 2718
Sales: 2719

Telegrams: *Okay.*

THE ORIENT INDUSTRIAL ENGINEERING CO., LTD.

Office: P. 16, Kalakar Street,
CALCUTTA.

Works: Jugselai, TATANAGAR
(SINGHBHUM).

Telephone: *Office*: *B. B.* 3655
Works:

Telegrams: *Sellers. Calcutta.*

THE ORIENTAL MERCANTILE CO., LTD.

Office: 36A, & B. Pratapaditya
Road, Kalighat,
CALCUTTA.

Works: 20, Justice Dwarkanath
Road, CALCUTTA.

Telephone: *Cal. South* 864 (*Cal.*)
Bombay 31304

Telegrams: *Orimerco, Bombay.*

P

THE PEEPUL IRON & STEEL INDUSTRIES LTD.

Office: Factory Area,
& Plot No. 34-35
Works: CAWNPORE.

Telephone: *Office*: 2328
Works: 2093

Telegrams: *Machinery.*

P—*Contd.*

P. N. DUTT & CO., LTD.

Office : 3A, Raja Kali Kissen
& Lane, P. O. Hatkhola,
Works : CALCUTTA.

Telephone : *B. B.* 1768

POMKO PRODUCTS.

Office :
& 4/8, Duncan Road,
Works : BOMBAY 8.

Telephone : 40910
Telegrams : *Autoheat.*

THE PRADIP LAMP WORKS.

Office :
& P. O. Bagumpur,
Works : PATNA CITY.

THE PREMIER AUTO-MOBILES LTD.

Office : Construction House,
Ballard Estate,
FORT, BOMBAY.

Telephone : 26036 & 21156
Telegrams : *Premobiles.*

THE PREMIER STORES SUPPLYING CO., LTD.

Office : 8, Royal Exchange Place,
CALCUTTA.

Works : 698, Circular Road,
HOWRAH.

Telephone : *Cal.* 563
Telegrams : *Rosintur.*

P—*Contd.*

THE PUNJAB FLOUR & GENERAL MILLS CO., LTD.

Office : Anarkali,
LAHORE.

Works : Shahdara Bagh,
LAHORE.

Telephone : 4067
Telegrams : *Pioneer.*

R

THE RADIO LAMP WORKS LTD.

Office :
& Country Club Road,
Works : KARACHI (SADDAR).

Telephone : 7676
Telegrams : *Bulbs.*

RADHEY LAL STEEL ROLLING MILLS.

Office : Rajgaddi Hatia,
CAWNPORE.

Works : Juhi Station,
CAWNPORE.

Telephone : *Office* :
Works : 2491
Telegrams : *Metalco.*

RAGHU ENGINEERING WORKS LTD.

Office :
& DELHI.
Works : 5, Daryaganj,

Telephone : 5717
Telegrams : *Raghuworks.*

RAJKINSON BROTHERS.

Office :
& Hoshiarpur Road,
Works : JULLUNDAR CITY.

Telegrams : *Rajkinson Brothers.*

R—*Contd.*

RAJKUMAR (INDIA) LTD.

Office : & *Works* : JULLUNDAR CITY.

RAMSARAN DASS AGGARWAL & SONS.

Office : & *Works* : Tanda Road, JULLUNDAR CITY.

Telegrams : *Chimniwala.*

THE RELIABLE WATER SUPPLY SERVICE OF INDIA LTD.

Office : & *Works* : Sanda Road, LAHORE (PUNJAB).

Telephone : *Office* : 2882
Br. Office : *Cal.* 5011

Telegrams : *Reliable, Lahore.*
Tejstraner, Calcutta.

RENWICK & CO., LTD.

Office : & *Works* : KUSHTIA (B. & A. RAILWAY).

S

SARU SMELTING & REFINING CORPORATION.

Office : (*Cal.*) Room No. 56A, 161-1 Harrison Road, CALCUTTA.

Office : & *Works* : Sadar Bazar, MEERUT.

Telephone : 262 Meerut.

Telegrams : *Metal, Meerut.*

S—*Contd.*

THE SCINDIA STEAM NAVIGATION CO., LTD.

Head Office : Scindia House, Ballard Estate, BOMBAY.

Cal. Office : 100, Clive Street, CALCUTTA.

Works : Gandhigram, VIZAGAPATAM.

Telephone : *Cal.* 5264
5265
119, *Vizgapatam*
30075 (6 *lines*) *Bombay.*

Telegrams : *Shilpi, Vizgapatam.*
Jalanath, Bombay.

SHAPARIA DOCK & STEEL CO., LTD.

Office : & *Works* : Sewree Fort Road, Sewree, BOMBAY.

Telephone : 61275
60897

Telegrams : *Shaparia.*

SHREE HANUMAN STEEL ROLLING MILLS.

Office : 8, Dalhousie Square, CALCUTTA.

Works : Ghusury, HOWRAH.

Telephone : *Office* : 4492
Works : *How.* 45

Telegrams : *Sooratrade.*

SHREE JAM WIRE PRODUCTS CO., LTD.

Office : Mherwan Building, Sir P. M. Road, BOMBAY.

Works : JAMNAGAR.

Telegrams : *Jamwire.*

S—*Contd.*

THE SIND IRON & STEEL WORKS LTD.

Office: P. B. No. 52, Saleh Mohd. Street, KARACHI.
Works: West Wharf Road, KARACHI.
Telephone: *Office*: 2165, 2430
Works: 2194
Telegrams: *Mettico.*

SINGH ENGINEERING WORKS LTD.

Office & *Works*: Grand Trunk Road, CAWNPORE.
Telephone: 2951
Telegrams: *Singh.*

SOKHEY INDUSTRIES.

Office: P. O. Box No. 56, AMRITSAR.
Works: P. O. Sultan Wind Town, P. O. Box No. 56. AMRITSAR.
Telegrams: *Chitra.*

THE STAR IRON WORKS.

Office & *Works*: LILLOOAH.
Telephone: *Howrah* 289
Telegrams: *Prithwipat, Lillooah.*

THE STAR METAL REFINERY.

Office: United India Building, Sir Ferozshah Mehta Rd., FORT, BOMBAY.
Works: Vikhroli (G. I. P.) BOMBAY.
Telephone: *Office*: 23391
Works: 87327
Telegrams: *Starmetal.*

S—*Contd.*

THE STEEL & MILLS CO., LTD.

Office: 3, Montegomery Road, LAHORE.
Works: Moghalpura, LAHORE.
Telephone: 4257
Telegrams: *'Steelmills', Moghalpura.*

THE STEEL EQUIPMENT & CONSTRUCTION LTD.

Office & *Works*: 22, Grand Trunk Road, Lillooah, HOWRAH.
Telephone: *Howrah* 399
Telegrams: *'Steelquip', Liluah.*

THE STEEL PRODUCTS LTD.

Office: 9, Clive Street, CALCUTTA.
Works: 96, Garden Reach Road, KIDDERPORE.
Telephone: *Office*: *Cal.* 577
Works: *South* 2410
Telegrams: *Adequate.*

STILLSON MANUFACTURING CO.

Office & *Works*: P. B. 312, LAHORE.

THE STRUCTURAL ENGINEERING WORKS LTD.

Office: Prospect Chambers Hornby Road, FORT, BOMBAY No. 1.
Works: Sewri Fort Road, BOMBAY.
Telephone: *Office*: 30167
Works: 60445
Telegrams: *Structural.*

S—Contd.

THE SWADESHI INDUSTRIES LTD.

Office: 100, Clive Street,
CALCUTTA.

Works: Panihati,
24 PARGANAS.

Telephone: *Office*: Cal. 2469
Works: *Barrakpore* 31
Telegrams: *Jaipuria, Calcutta.*

T

TATA IRON & STEEL CO., LTD.

Office: 102A, Clive Street,
CALCUTTA.

Works: Jamshedpur,
DIST. SINGHBHUM.

Telephone: *Office*: *Cal.* 4477

Telegrams: *Ironco, Jamshedpur*
Tatairon, Calcutta.

THE TEXTILE MACHINERY CORPN. LTD.

Office: 8, Royal Exchange Place,
CALCUTTA.

Works: P. O. Belgharia,
24 PARGANAS.
Birla Lines,

Telephone: *Cal.* 562 & B.B. 6061.
Telegrams: *Texmaco, Calcutta.*

THE TIN PRINTING & METAL WORKS LTD.

Office: Grand Trunk Road,
& Subzimandi, P. O.
Works: DELHI.

Telephone: 5645
Telegrams: *Tin.*

U

THE UNITED INDUSTRIAL PRODUCTS.

Office: 3, Dinga Singh Building,
& The Mall,
Works: LAHORE.

THE UNITED IRON & STEEL CORPN. LTD.

Office: 9, Clive Row,
CALCUTTA.

Works: 5/6, Tarachand Ganguli Street, Belur,
HOWRAH.

Telephone: *Howrah*: *Cal.* 3253
Telegrams: *Buyers.*

THE UNIVERSAL SCREW FACTORY.

Office: Chheharata (N. W. R.)

Works: Grand Trunk Road,
CHHEHARATA
(N. W. R.)

Telephone: *Amritsar* 482
Telegrams: *Uniscrewfy.*

USHA BOLT & NUT CO.

Office: Khandelwal Bhawan
& 5, Hanspukar Lane,
Works: CALCUTTA.

Telephone: *B. B.* 5074
Telegrams: *Ushanpay.*

V

VASANT INDUSTRIAL & ENGINEERING WORKS.

Office: 470-71, Worli Road,
& BOMBAY 18.
Works:

Telephone: 45520
Telegrams: *Astronomy.*

V—*Contd.*

VICTOR INDUSTRIES.

Office & *Works*: V. Sultan Wind,
AMRITSAR.

Telegrams: *Woodscrew.*

VICTORY ENGINEERING WORKS.

Office & *Works*. CALCUTTA.
40, Tangra Road,

Telephone: *Cal.* 797

W

W. LESLIE & CO.

Office: Clive Buildings,
& 8, Clive Street,
Works: CALCUTTA.

Telephone: *Cal.* 1034 & 4984
Telegrams: *Metals.*

W. LESLIE & CO. (PUNJAB) LTD.

Office: LAHORE.

Works: Grand Trunk Rd., Oppo.
H. M. Mint,
LAHORE.

Telephone: *Office*: 5011
Works: 2187
Telegrams: *Leslieco.*

NOTE :—In this list, as far as possible, only one office and factory addresses have been given. Complete details regarding addresses of Head Office, Branch Offices and Works will be found in the description of individual factories.

Engineering Association of India

BRANDS AND TRADE MARKS

Complete Addresses of Manufacturers and Producers will be found on pages 15 to 32

BRANDS & TRADE MARKS	APPLICATIONS	FIRM OR COMPANY
A.C.A.	Electric Appliances.	O. K. ELECTRIC WORKS LTD., LAHORE.
A.C.B.N.	Sanitary Fittings, Water Fittings, Gun Metal, Iron Chains.	AMIN CHAND BHOLANATH, JULLUNDUR CITY.
AGRICO	Agricultural Implements.	TATA IRON & STEEL CO., LTD., CALCUTTA.
Ajax	Steel Furniture of all kinds. Fitting Cabinets Card Index Cabinets Security Cabinets and other cabinets, safes, strong room doors, racks of all types, cash boxes and hospital furnitures.	AJAX PRODUCTS LTD., MADRAS.

Mark	Goods	Proprietor
Ajax	Abrasive Preparations. Abrasive Papers Cloths, belts, discs, tapes etc. made from abrasive material such as emery, garnet fluid, quartz, corundum ajaxite, silcarb Optical Fines and abrasive wheels and grinding machines.	AJAX PRODUCTS LTD., G. T. MADRAS.
ANAND	Steel cabinet, Furniture of all types including Hospital beds & steel equipment.	ANAND METAL & STEEL WORKS C/O. ANAND RAM MAHADEO LAL, CALCUTTA.
HALL MARK ANGLO DUTCH PAINT COLOUR & VARNISH WORKS LTD. OF QUALITY	High Class Paints, Colours, Varnishes, Enamels etc.	ANGLO DUTCH PAINT COLOUR & VARNISH WORKS LTD., LAHORE.
APJ	Brass & G. M. Fittings, Bolts & Nuts, Chaff Cutter Machines and blades.	AMIN CHAND PAYRE LAL, JULLUNDER CITY.

BRAND & TRADE MARKS	APPLICATIONS	FIRM OR COMPANY
AERO-DISSEL 'AD'	Antifriction Bearing Metals.	THE INDIAN STANDARD METAL CO., LTD., BOMBAY.
AZAD	D. C. Fans.	KASSELS LTD., DELHI.
BATU	All kinds of small cutting tools, jigs, fixtures & Dies & Punches.	BHARAT TOOL MFG. CO., LTD., BOMBAY.
B. B. W.	Beltings of all types.	BENGAL BELTING WORKS LTD., CALCUTTA.
BENGAL	Electric Lamp.	BENGAL ELECTRIC LAMP WORKS LTD., CALCUTTA.
BENI	Electrical Accessories, Electrical Appliances (Household), Electric Fans and Regulators, Electric Pole Fittings, Railway Stores.	B. M. SINGH & SON, CALCUTTA.
BHARAT	Electric Fans.	INDIA ELECTRIC WORKS LTD., CALCUTTA.
BHOLA	Locks.	AMIN CHAND BHOLANATH, JULLUNDER CITY.
B. M. W.	Anti-friction white metals, Tin Solders, Type metals, Gun metals, Phospher, Bronzes, Bell metal, Brass, Aluminium Alloys, Lead Brônze, Manganse Bronze etc.	THE BINANI METAL WORKS LTD., CALCUTTA.

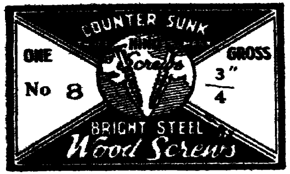
B. M. CALCUTTA W. L.	Metal Utensils.	BENGAL METAL WORKS LTD., CALCUTTA.
Bolinjkar (Regd. Trade Mark)	Steel Belt Lacings.	BOLINJKAR METAL WORKS, BOMBAY.
BP LTD CALCUTTA	Crockery of all types and Electric Insulators.	BENGAL POTTERIES LTD. CALCUTTA.
BUNGO	Steel Furniture of all types including Hospital beds and security equipment.	BUNGO STEEL FURNITURE LTD., CALCUTTA.
CALEDON	Heating Stove.	THE JAY ENGINEERING WORKS LTD., 24 PARGANAS.

BRAND & TRADE MARKS	APPLICATIONS	FIRM OR COMPANY
Cat Brand	Sand Paper, Emery Paper & Emery Cloth.	KRISHNA LAL THIRANI & CO. LTD., CALCUTTA.
MEW CAT BRAND	Enamel Wares.	MADRAS ENAMEL WORKS LTD., MADRAS.
C. E. M.	Expanded Metal.	CALCUTTA EXPANDED METAL MFG. CO. LTD., CALCUTTA.
CHOWRINGHEE	Cooking Ranges.	THE JAY ENGINEERING WORKS LTD., 24 PARGANAS.

COOPER	Diessel Oil Engines and Machine Tools.	MESSRS. COOPER ENGINEERING LTD., SATARA ROAD.
	Aluminium, Brass and other metal wares.	JEEWANLAL (1929) LTD., CALCUTTA.
	Drills, Reamers, Cutters.	THE INDIAN TOOL MANUFACTURERS LTD., BOMBAY.
DOLOHAR	Small Tools.	DOLOHAR LTD., CALCUTTA.
	Non-ferrous alloys and metals.	THE INDIAN SMELTING & REFINING CO., LTD., BOMBAY.
DOUBLE JACKAL	Cooking Ranges.	MESSRS. JAY ENGINEERING WORKS LTD., 24 PARGANAS.

BRANDS & TRADE MARKS	APPLICATIONS	FIRM OR COMPANY
DOUBLE RING BRAND	Gun metal, Phosphor Bronze, Brass, Nickel, Silver, Aluminium & other non-ferrous ingots.	THE INDIAN STANDARD METAL CO. LTD., BOMBAY.
DUTT	Machine Tools.	P. N. DUTT & CO. LTD., CALCUTTA.
EAGLE.	All kinds of G. M. Brass Water and other Sanitary fittings, such as Brass Bib, Plug, Wheels, Cocks, Showers, Brass Presses etc.	BOMBAY BRASS WORKS CO., JULLUNDUR CITY.
ELFA.	Fans-exhaust and Pedestal.	THE ELECTRIC FAN AND MOTOR MFG. CO. LTD., LAHORE.
ENTALLY	Fan Regulators.	INDIA ELECTRIC WORKS LTD., CALCUTTA.
EWI LTD. SYMBOL OF PERFECTION	Fans.	ENGINEERING WORKS OF INDIA LTD., CALCUTTA.

GLOBE	Wood Screws.	UNIVERSAL SCREW FACTORY, CHHEHARATA (N. W. R.)
Godrej	Automatic Filing Cabinets, Card Index Cabinets, Steel, Office household and Hospital Furniture, Safes, Shelving Racks, Security Equipment, Locks.	GODREJ & BOYCE MFG. CO., LTD., BOMBAY.
Godrej Trade Mark	Locks.	GODREJ & BOYCE MFG. CO. LTD., BOMBAY.
H. B. C.	Cycles.	HINDUSTAN BICYCLE MFG. & INDUSTRIAL CORPN. LTD., CALCUTTA.
HERO	Galvanised Stitching Wire, Galvanised Stranded Wire, Electrode Wire, Pin Wire, & various types of Spring Steel Wires.	THE INDIAN STEEL & WIRE PRODUCTS LTD., CALCUTTA.
HIMALAYA	Railway Carriage Fans & Regulators.	INDIA ELECTRIC WORKS Ltd., CALCUTTA.

BRANDS & TRADE MARKS	APPLICATIONS	FIRM OR COMPANY
HIND	Cycles & Spare Parts.	HIND CYCLE LTD., BOMBAY.
	Wood Screws.	HIND SCREWS, DELHI.
HINDUSTAN	Motor Cars.	HINDUSTAN MOTORS LTD., CALCUTTA.
Humeogenous	Concrete Pipes.	INDIAN HUME PIPE CO. LTD., BOMBAY.
Humepipe	Concrete Pipes.	INDIAN HUME PIPE CO. LTD., BOMBAY.
Humesteel	Concrete Pipes.	INDIAN HUME PIPE CO. LTD., BOMBAY.

Trade Mark	Goods	Proprietors
IEW	Fans, Electric Bakelite Fittings, Domestic appliances; Instruments.	INDIA ELECTRIC WORKS LTD., CALCUTTA.
INDIA CYCLE	Cycles.	INDIA CYCLE MFG. CO. CALCUTTA.
INDIA	Electric Lamp.	BENGAL ELECTRIC LAMP WORKS, CALCUTTA.
India	Electric Fans.	INDIA ELECTRIC WORKS LTD., CALCUTTA.
INDIA	Cycle Bells, Lamps, Carriers and other components.	INDIA CYCLE MFG. CO., CALCUTTA.
221 INDIA	Electro Technical goods, *viz*:—Switches, Ceiling Roses, Fuse Cut-outs, joint cut-outs etc. etc.	SWADESHI INDUSTRIES LTD., CALCUTTA.
I. M. C.	Malleable Iron Castings of all types.	INDIAN MALLEABLE CASTINGS LTD., CALCUTTA.
INVESTA	Lathes, Shearing & Punching M/C Drilling M/C.24″ Core Making M/C Mandrill Press Polishing M/C. P-1 & P-2. Brick Making M/C.	INVESTA MACHINE TOOLS & ENGINEERING CO. LTD., BOMBAY.
ISM	Tin Solder, Type-Metal, Acid & Alkali resisting alloys.	THE INDIAN STANDARD METAL CO. LTD., BOMBAY.

BRANDS & TRADE MARKS	APPLICATIONS	FIRM OR COMPANY
JAY.	Railway Safety Appliances, Water Meters, Cooking Ranges, Electric Fans and Hurricane Lanterns.	JAY ENGINEERING WORKS LTD., 24 PARGANAS.
JAYANT	Brass, Copper & Bronze Metal building fixtures.	JAYANT METAL MFG. CO., BOMBAY.
J. M. I.	Gum-metal, Phosphor Bronze and other ingots.	JAIPUR METAL INDUSTRIES LTD., JAIPUR (RAJPUTANA).
JYOTI	Hurricane Lanterns.	THE JAY ENGINEERING WORKS LTD., 24 PARGANAS.
JYOTI	Pumps, Paper cutting & Welding machines, Presses, Steel Vessels & Industrial plants.	JYOTI LTD., BARODA.
K	Hammers, Augers, Vices, Hand band, Circular Saws, Axes, Beaters, Shovels, *Powrahs* & Agricultural implements of every kind.	KAMANI ENGINEERING CORPN. LTD., BOMBAY.
K1, K2, K3 and Kx	White Metal.	THE JAIPUR METAL INDUSTRIES LTD., JAIPUR (RAJPUTANA).

Mark	Goods	Proprietor
KASSELS	A. C. Capacitor Fans.	KASSELS LTD., DELHI.
KC KAYCEE	Electric fans including ceiling, table, cabin & exhaust fans, Lamps, motors, Sirens, generators, transformers, flash testers, laboratory apparatus, expanded metal, electrical measuring Instruments, Glass Tumblers, Table hollow wares, Dry cells.	KAYCEE INDUSTRIES LTD., LAHORE.
Kirloskar	Electric motors, agricultural Implements, Pumps.	KIRLOSKAR BROS. LTD., KIRLOSKARVADI, SATARA.
	Buckets, Tubs, heaters etc.	AMIN CHAND PAYARE LAL, JULLUNDUR CITY.

BRANDS & TRADE MARKS	APPLICATIONS	FIRM OR COMPANY
LESLIE	Cooking Ranges.	THE JAY ENGINEERING WORKS LTD., 24 PARGANAS.
NATIONAL'S LION BRAND	Glass-Paper.	THE NATIONAL SAND PAPER MILLS (INDIA) LTD., RAWALPINDI.
LUCKY	A. C. Non-Capacitor Fans.	KASSELS Ltd., DELHI.
MEEHANITE METAL	Meehanite Metal.	COOPER ENGINEERING LTD., SATRA ROAD.
METRO PEN	Fountain Pens.	DHIRAJLAL & CO., BOMBAY.

Metrohole	Electric Motors, Fans.	METROPOLE WORKS, VERKA, AMRITSAR.
MUKAND	Rolled Bars, Angles, Hoops, Steel & Iron.	MUKAND IRON & STEEL WORKS, LAHORE.
MSP	Spraying Pistol.	METAL SPRAYING PRODUCTS. CALCUTTA.
	Wood Screws, Machine Screws.	NARAINDAS IDUSTRIES LTD., LAHORE.
NICCO	Cables & Wires for all electrical purposes	NATIONAL INSULATED CABLE CO. OF INDIA LTD., CALCUTTA.

BRANDS & TRADE MARKS	APPLICATIONS	FIRM OR COMPANY
N. I.	For all products.	NATIONAL METAL INDUSTRIES LTD., CALCUTTA.
NIPPER	Cooking Stoves.	JAY ENGINEERING WORKS LTD., 24 PARGANAS.
O. K.	Ceiling, Table, Pedestal, Carriage & Exhaust fans, Heating appliances Electric Motors, Resistance Regulators, Sirens, Lamps, Brackets, Transformers.	O. K. ELECTRIC WORKS LTD., LAHORE.
OLYMPIC	Foutain Pens.	DHIRAJLAL & CO., BOMBAY.
O. M. C.	Fans, Lamps & Electrical Accessories.	ORIENTAL MERCANTILE CO., CALCUTTA.
ORIENT	Ceiling & Table fans & other all kinds of electrical & plastic goods products ;	CALCUTTA ELECTRICAL MFG. CO. LTD., CALCUTTA.
PARIS	Fountain Pens.	DHIRAJLAL & CO., BOMBAY.
	Valves, Cocks, Screw, Cutting Tools etc.	PEEPUL IRON & STEEL INDUSTRIES LTD., CAWNPORE.

Engineering Association of India

BUYER'S GUIDE

Complete Addresses of Manufacturers and Producers will be found on pages 15 to 32

A

Abrasives

Ajax Products Ltd. ... Madras.
Krishnalal Thirani & Co. Ltd. ... Calcutta.
National Sandpaper Mills (India) Ltd. ... Rawalpindi.
Hindusthan Abrasives ... Bihta (Bihar).

Adjustable Spanners

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Agricultural Implements & Machinery

Kamani Engineering Corporation Ltd. ... Bombay.
Cooper Engineering Ltd. ... Satara.
Kirloskar Brothers Ltd. ... Satara.
Sind Iron & Steel Works Ltd. ... Karachi.
Abdul Qayum Fazal Mohd. & Co. ... Jullundur City.
Singh Engineering Works Ltd. ... Cawnpore.
Tata Iron & Steel Co., Ltd. ... Calcutta.
Aminchand Payarelal ... Jullundur City.
Aminchand Bholanath ... Jullundur City.
D. K. Das & Co. Ltd. ... Howrah.
Jyoti Ltd. ... Baroda.
Khem Chand Raj Kumar ... Jullundur City.
Hind Machines Ltd. ... Howrah.
Ludhiana Steel Rolling Mills ... Ludhiana.
Peepul Iron & Steel Industries Ltd. ... Cawnpore.
Hind Tank Manufacturing Co. ... Bombay.
Steel Equipment & Construction Ltd. ... Lilluah.
Khiali Ram Gujjar Mall ... Montogmery (Pb.)
Ram Saran Dass Aggarwal & Sons. ... Jullundur City.
Jay Engineering Works Ltd. ... Calcutta.
Shaparia Dock & Steel Co. Ltd. ... Bombay.

A—*Contd.*

Air Conditioning Equipment

Cooper Engineering Ltd.	...	Satara.
Jas. Alexander & Co., Ltd.	...	Calcutta.
Hind Machine Ltd.	...	Howrah.
Hind Tank Manufacturing Co.	...	Bombay.

Almirahs (Steel)

Godrej & Boyce Manufacturing Co., Ltd.	...	Bombay.
Steel Equipment & Construction Ltd.	...	Lilooah.
Bungo Steel Furniture Ltd.	...	Calcutta.
Harbanslal Malhotra & Sons Ltd.	...	Calcutta.
Steel Products Ltd.	...	Calcutta.

Aluminium Alloys & Castings

(See non-ferrous metals & alloys)

Aluminium Sheets

(See non-ferrous metals & alloys)

Aluminium Wares

Hyderabad Brass Products Ltd.	...	Secundrabad (Deccan).
Jeewanlal (1929) Ltd.	...	Calcutta.
Kamani Engineering Corporation Ltd.	...	Bombay.
Mysore Premier Metal Factory	...	Madras.
Hindustan Metal Refinery & Rolling Mills	...	Madras.
Jamnadas Brothers	...	Calcutta.

Angithies

Ram Saran Das Aggarwal & Sons	...	Jullundur City.
Aminchand Payarelal	...	Jullundur City.

Antimony

(See non-ferrous Metals & Alloys)

Anti Corrosive Cast Iron

Jamshedpur Engineering & Machine Manufacturing Co., Ltd.	...	Tatanagar.

Automobiles

Hindustan Motors Ltd.	...	Calcutta.
Premier Automobiles Ltd.	...	Bombay.

B

Baby Cars

Mapara Parekh & Co. ... Bombay.

Band Saws

Hind Machines Ltd. ... Howrah.

Bars (Iron & Steel)

(See Mild Steel Sections)

Batteries

Kaycee Industries Ltd. ... Lahore.
Oriental Mercantile Co., Ltd. ... Calcutta.

Belt-Lacings (Steel)

Bolinjkar Metal Works ... Bombay.
Hind Tank Manufacturing Co. ... Bombay.

Beltings

Bengal Belting Works Ltd. ... Calcutta.

Bench Drilling Machines

Peepul Iron & Steel Industries Ltd. ... Cawnpore.
Cooper Engineering Ltd. ... Bombay.
Hind Machines Ltd. ... Howrah.

Bench Vices

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Billets

Tata Iron & Steel Co., Ltd. ... Calcutta.
Bhartia Electric Steel Co., Ltd. ... Calcutta.
Indian Hume Pipe Co., Ltd. ... Bombay.

Blades (Chaff Cutter)

Ram Saran Dass Aggarwal & Sons ... Jullundur City.
Aminchand Payarelal ... Jullundur City.

Blowers & Burners

Jyoti Ltd. ... Baroda.

Boats (Steel)

Shaparia Dock & Steel Co. Ltd. ... Bombay.
Howrah Trading Co., Ltd. ... Calcutta.
Hind Tank Manufacturing Co. ... Bombay.

B—*Contd.*

Bolts & Nuts

Jayant Metal Manufacturing Co. ... Bombay.
D. N. Singha & Co., Ltd. ... Howrah.
Indian Steel & Wire Products Ltd. ... Calcutta.
Abdul Qayum Fazal Mohd. & Co. ... Jullundur City.
Aminchand Payarelal ... Jullundur City.
Aminchand Bholanath ... Jullundur City.
Khemchand Rajkumar ... Jullundur City.
Bombay Brass Works Co. Jullundur City.
D. K. Dass & Co., Ltd. ... Howrah.
Mantri Machinery Factory Ltd. ... Calcutta.
Ludhiana Steel Rolling Mills ... Ludhiana.
Hind Tank Manufacturing Co. ... Bombay.
Metropole Works ... Amritsar.
Ram Saran Dass Aggarwal & Sons ... Jullundur City.
Usha Bolt & Nut Co. ... Calcutta.

Box Strapping Machines

Narain Engineering ... Calcutta.

Brass & G M. Water Fittings

Ram Saran Dass Aggarwal & Sons ... Jullundur City.
Aminchand Payarelal ... Jullundur City.
Bombay Brass Works Co. ... Jullundur City.

Brass Sheets

(See non-ferrous metals & alloys)

Brass-Wares

Jeewanlal (1929) Ltd. ... Calcutta.
Mysore Premier Metal Factory ... Madras.
Jamnadas Bros. ... Calcutta.
Tin Printing & Metal Works Ltd. ... Delhi.

Brick & Tile Making Machinery

Investa Machine Tools & Engineering Co., Ltd. Bombay.
Hind Tank Manufacturing Co. ... Bombay.
Garlick & Co., Ltd. ... Bombay.

Buckets

Ramsaran Dass Aggarwal & Sons ... Jullunder City.
Aminchand Bholanath ... Jullunder City.
Abdul Qayum Fazal Mohammad & Co. ... Jullunder City.
Bengal Metal Works Ltd. ... Calcutta.
Howrah Trading Co., Ltd. ... Calcutta.
Hind Machines Ltd. ... Howrah.

B—*Contd.*

Building Equipment

Acme Manufacturing Co., Ltd.	...	Bombay.
Oriental Industrial Engineering Co., Ltd.	...	Calcutta.
India Engineering Works Ltd.	...	Delhi.
Jayant Metal Manufacturing Co.	...	Bombay.
Bolinjkar Metal Works	...	Bombay.
Mysore Iron & Steel Works	...	Bhadravati (Mysore).
Shaparia Dock & Steel Co., Ltd.	...	Bombay.
Hind Tank Manufacturing Co.	...	Bombay.
Garlick & Co., Ltd.	...	Bombay.
Aminchand Bholanath	...	Jullunder City.
Tin Printing & Metal Works Ltd.	...	Delhi.

Bus Horns

Aminchand Bholanath	Jullundur City

C

Cabinets

Godrej & Boyce Manufacturing Co., Ltd.	...	Bombay.
Bungo Steel Furniture Ltd.	...	Calcutta.
Steel Products Ltd.	..	Calcutta.
Harbanslal Malhotra & Sons Ltd.	...	Calcutta.
Tin Printings & Metal Works Ltd.	...	Delhi.
Ajax Products Ltd.	...	Madras.
Anandram Mahadeolal	...	Calcutta.

Cane *Kolhoos* (Bullock Driven)

Peepul Iron & Steel Industries Ltd.	...	Cawnpore.
Renwick & Co., Ltd.	...	Kushtia.
Chuttan Lall Mattu Mal	...	Delhi.

Capstan Lathes

Cooper Engineering Ltd.	...	Satara (Bombay).

Carts (Steel)

Howrah Trading Co., Ltd.	...	Calcutta.
Garlick & Co., Ltd.	...	Bombay.

Cash Boxes & Coffers

Godrej & Boyce Manufacturing Co., Ltd.	...	Bombay.
Ajax Products Ltd.	...	Madras.

C—*Contd.*

Castings (Iron)

G. T. R. Co., Ltd.	...	Calcutta.
Aminchand Payarelal	...	Jullundur City.
India Machinery Co., Ltd.	..	Calcutta.
Britannia Engineering Works & Foundry	...	Calcutta.
Castings Corporation of India Ltd.	...	Howrah.
Chhuttan Lall Mattu Mal	...	Delhi.
D. K. Das & Co., Ltd.	...	Howrah.
Star Iron Works	...	Lillooah.
Mysore Iron & Steel Works	..	Bhadravati (Mysore).
Hind Tank Manufacturing Co.	...	Bombay.
Jas. Alexander & Co., Ltd.	...	Calcutta.
Hind Machines Ltd.	...	Howrah.
Jamshedpur Engineering & Machine Manufacturing Co., Ltd.	...	Tatanagar.
Mukand Iron & Steel Works Ltd.	...	Bombay.
Cooper Engineering Ltd.	...	Satara (Bombay).
Metropole Works	...	Verka (Amritsar).
Indian Hume Pipe Co., Ltd.	...	Bombay.
Shaparia Dock & Steel Co., Ltd.	...	Bombay.
Howrah Trading Co., Ltd.	...	Calcutta.
Peepul Iron & Steel Industries Ltd.	...	Cawnpore.

Castings (Steel)

Bhartia Electric Steel Co., Ltd.	...	Calcutta.
Mukand Iron & Steel Works Ltd.	...	Bombay.
Mysore Iron & Steel Works	...	Bhadravati (Mysore).
Steel & General Mills Co., Ltd.	...	Lahore.
J. K. Iron & Steel Co., Ltd.	...	Cawnpore.
National Iron & Steel Co., Ltd.	...	Calcutta.
Singh Engineering Works Ltd.	...	Cawnpore.
Indian Hume Pipe Co., Ltd.		Bombay.
Indian Steel & Wire Products Ltd.	...	Calcutta.

Castings (non-ferrous)

(See non-ferrous metals & alloys)

Cement machinery

(See Industrial Plant & Machinery)

Chains (M S)

Amin Chand Payarelal	...	Jullundur City.
Khem Chand Raj Kumar	...	Jullundur City.
Garlick & Co., Ltd.	...	Bombay.
Ram Saran Dass Aggarwal & Sons	...	Jullundur City.
Aminchand Bholanath	...	Jullundur City.

C—*Contd.*

Chilled Cast Iron

Jamshedpur Engineering & Machine Manufacturing Co., Ltd. ... Tatanagar.

Chimneys

Hind Tank Manufacturing Co. ... Bombay.
Jas. Alexander & Co., Ltd. ... Calcutta.
Steel Products Ltd. ... Calcutta.
Hind Machines Ltd. ... Howrah.
Jyoti Ltd. ... Baroda.
Mysore Iron & Steel Works ... Bhadravati (Mysore).
Garlick & Co., Ltd. ... Bombay.
Indian Hume Pipe Co., Ltd. ... Bombay.
Shaparia Dock & Steel Co., Ltd. ... Bombay.

Chimney Ware

Ogale Glass Works Ltd. ... Satara.

Circular Saws

Hind Machines Ltd. Howrah.
Bharat Tool Manufacturing Co., Ltd. ... Bombay.
Kamani Engineering Corporation Ltd. ... Bombay.

Cisterns

United Iron & Steel Corporation Ltd. ... Calcutta.
Jas. Alexander & Co., Ltd. ... Calcutta.
Castings Corporation (India) Ltd. ... Howrah.
Hind Machines Ltd. ... Howrah.
Hind Tank Manufacturing Co. ... Bombay.
Indian Hnme Pipe Co., Ltd. ... Bombay.
Jay Engineering Works Ltd. ... 24 Parganas.
Shaparia Dock & Steel Co., Ltd. ... Bombay.

Clips (paper)

Indian Engineering Corporation Ltd. ... Amritsar.
Indian Clock Manufacturing Co., Ltd. ... Jamshedpur.

Clips (gem)

Indian Clock Manufacturing Co., Ltd. ... Jamshedpur.
Shree Ram Wire Products Ltd. ... Bombay.

Clocks

Indian Clock Manufacturing Co., Ltd. ... Jamshedpur.

C—*Contd.*

Cocks & Valves & Hydrant

D. K. Das & Co., Ltd.	...	Howrah.
Peepul Iron & Steel Industries Ltd.	...	Cawnpore.
Aminchand Payarelal	...	Jullundur City.
Aminchand Bholanath	...	Jullundur City.
Bombay Brass Works Co.	...	Jullundur City.
Kirloskar Brothers Ltd.	...	Satara.
Garlick & Co., Ltd.	...	Bombay.
G. T. R. Co., Ltd.	...	Calcutta.

Condensers

Saru Smelting & Refining Co.	...	Calcutta.
Garlick & Co., Ltd.	...	Bombay.
Hind Tank Manufacturing Co.	...	Bombay.

Colliery Stores

Howrah Trading Co., Ltd.	...	Calcutta.
Bhartia Electric Steel Co., Ltd.	...	Calcutta.

Containers

Mapara Parekh & Co.	...	Bombay.
Tin Printing & Metal Works Ltd.	...	Delhi.
Aminchand Payarelal	...	Jullundur City.
Khem Chand Rajkumar	...	Jullundur City.
Hind Tank Manufacturing Co.	...	Bombay.
Aminchand Bholanath	..	Jullundur City
Hind Machines Ltd.	...	Howrah.
Usha Bolt & Nut Co.	...	Calcutta.

Copper Sheets

(See Non-ferrous metals & alloys)

Copper-Ware

Jeewanlal (1929) Ltd.		Calcutta.
Mysore Premier Metal Factory	...	Madras.
Jamnadas Bros.	...	Calcutta.

Cutlery

Steel Equipment & Construction Ltd.	...	Calcutta.

Cycle

Hindustan Bicycle Manufacturing & Industrial Corporation Ltd.	...	Calcutta.
Hind Cycles Ltd.	...	Bombay.

C—*Contd.*

Cycle Bells

India Cycle Manufacturing Co., Ltd. ... Calcutta.

Cycle Carriers

India Cycle Manufacturing Co., Ltd. ... Calcutta.
Ludhiana Steel Rolling Mills ... Ludhiana.

Cycle Lamps

India Cycle Manufacturing Co., Ltd. ... Calcutta.

Cycle Parts

Hindustan Bicycle Manufacturing & Industrial Corporation Ltd. ... Calcutta.
Hind Cycles Ltd. ... Bombay.
India Cycle Manufacturing Co., Ltd. ... Calcutta.
Ludhiana Steel Rolling Mills ... Ludhiana.
Sokhey Industries ... Amritsar.
Bolinjkar Metal Works ... Bombay.
Hind Tank Manufacturing Co. ... Bombay.
Aminchand Bholanath ... Jullundur City

Cycle Pumps

India Cycle Manufacturing Co., Ltd. ... Calcutta.

Cylinders

United Iron & Steel Corporation Ltd. ... Calcutta.
Jas. Alexander & Co., Ltd. ... Calcutta.
Hind Machines Ltd. ... Howrah.
Hind Tank Manufacturing Co. ... Bombay.

D

Doors (Sliding)

Howrah Trading Co., Ltd. Calcutta.
Hind Machines Ltd. ... Howrah.
Jas. Alexander & Co., Ltd. ... Calcutta.

Drain Cocks

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

D—*Contd.*

Drilling Machines

Cooper Engineering Ltd. ... Satara.
Metropole Works ... Amritsar.
India Machinery Co. Ltd. ... Calcutta.
Hind Machines Ltd. ... Howrah.
Jas. Alexander & Co., Ltd. ... Calcutta.

Drums

United Iron & Steel Corporation Ltd. ... Calcutta.
Aminchand Payarelal ... Jullundur City
Khem Chand Raj Kumar ... Jullundur City.
Hind Machines Ltd. ... Howrah.
Hind Tank Manufacturing Co. ... Bombay.
Ram Saran Dass Aggarwal & Sons ... Jullundur City.
Aminchand Bholanath ... Jullundur City.

Dry Cells

Kaycee Industries Ltd. Lahore.

E

Electrical Accessories

India Electric Works Ltd. ... Calcutta.
D. N. Singha & Co., Ltd. ... Howrah.
O. K. Electric Works Ltd. ... Lahore.
Calcutta Electrical Manufacturing Co., Ltd. ... Calcutta.
Electrical Fan & Motor Manufacturing Co., Ltd. ... Lahore.
Engineering Works of India Ltd. ... Calcutta.
Kaycee Industries Ltd. ... Lahore.
Raghu Engineering Works Ltd. ... Delhi.
Sokhey Industries ... Amritsar.
Metropole Works ... Amritsar.
G. T. R. Co., Ltd. ... Calcutta.
Castings Corporation (India) Ltd. ... Howrah.
Hind Tank Manufacturing Co. ... Bombay.
B. M. Singh & Son ... Calcutta.
Oriental Mercantile Co., Ltd. ... Calcutta.

Electric Appliances (household)

Jay Engineering Works Ltd. ... 24 Parganas.
Pomko Products ... Bombay.
Sokhey Industries ... Amritsar.
India Electric Works Ltd. ... Calcutta.
O. K. Electric Works Ltd. ... Lahore.
Metropole Works ... Amritsar.
B. M. Singh & Son ... Calcutta.

E—*Contd.*

Electric Fans & Regulators

Calcutta Electrical Manufacturing Co., Ltd. ... Calcutta.
Electrical Fan & Motor Manufacturing Co., Ltd. ... Lahore.
Engineering Works of India Ltd. ... Calcutta.
India Electric Works Ltd. ... Calcutta.
Kaycee Industries Ltd. ... Lahore.
O. K. Electric Works Ltd. ... Lohore.
Oriental Mercantile Co., Ltd. ... Calcutta.
Raghu Engineering Works Ltd. ... Delhi.
Sokhey Industries ... Amritsar.
Metropole Works ... Amritsar.
G. T. R. Co., Ltd. ... Calcutta.
B. M. Singh & Son ... Calcutta.
Jay Engineering Works Ltd. ... 24 Parganas.
Kassels Ltd. ... Delhi.

Electric Lamp

Bengal Electric Lamp Works Ltd. ... Calcutta.
Kaycee Industries Ltd. ... Lahore.
Pradip Lamp Works ... Patna City.
Radio Lamp Works Ltd. ... Karachi (Saddar).

Electric Measuring Instruments

Kaycee Industries Ltd. ... Lahore.

Electric Motors

Kaycee Industries Ltd. ... Lahore.
Kirloskar Brothers Ltd. ... Satara.
Metropole Works ... Verka (Amritsar).
O. K. Electric Works Ltd. ... Lahore.
India Electric Works Ltd. ... Calcutta.

Electric Pole fittings

Ludhiana Steel Rolling Mills ... Ludhiana.
National Metal Industries Ltd. ... Calcutta.
India Electric Works Ltd. ... Calcutta.
Indian Hume Pipe Co., Ltd. ... Bombay.
Hind Tank Manufacturing Co. ... Bombay.
Meropole Works ... Amritsar.
B. M. Singh & Son ... Calcutta.
Hind Machines Ltd. ... Howrah.

Electric Transformers

Kaycee Industries Ltd. ... Lahore.

E—*Contd.*

Electric Wares & Cables

National Insulated Cable Co. of India Ltd. ... Calcutta.

Enamelled Wares & Enamelling

Madras Enamel Works Ltd. ... Madras.
Indian Enamel Works Ltd. ... Bombay.
India Electric Works Ltd. ... Calcutta.
Ogale Glass Works Ltd. ... Satara.
Kamani Engineering Corporation Ltd. ... Bombay.

Exhaust Fans and Sirens

Kaycee Industries Ltd. ... Lahore.
Electrical Fan & Motor Manufacturing Co., Ltd. ... Lahore.
Jas. Alexander & Co., Ltd. ... Calcutta.
O. K. Electric Works Ltd. ... Lahore.
Metropole Works ... Amritsar.

Expanded Metal

Calcutta Expanded Metal Manufacturing Co., Ltd. ... Calcutta.
Indian Expanded Metals Ltd. ... Bombay.
Kaycee Industries Ltd. ... Lahore.
Hindustan Wire & Metal Products Ltd. ... Calcutta.

F

Ferro-Silicon

Mysore Iron & Steel Works ... Bhadravati (South India).

Files

Mukand Iron & Steel Works Ltd. ... Bombay.
Khem Chand Raj Kumar ... Jullundur City.
Aminchand Bholanath ... Jullundur City.

Filter Presses

Jyoti Ltd. ... Baroda.

Fish-net Weights

Star Iron Works ... Lilooah.
India Machinery Co., Ltd. ... Calcutta.

F—*Contd.*

Fountain pens

Dhirajlal & Co. ... Bombay.

Furniture (Steel)

(See "Steel Security Equipment")

G

Gas Plant

Mapara Parekh & Co. ... Bombay.

Glass Globes (for Hurricane Lanterns)

Ogale Glass Works Ltd. ... Satara.

Glass Shells

Kaycee Glass Works Ltd. ... Shikohabad (UP).
Bengal Electric Lamp Works Ltd. ... Calcutta.

Glass Tiles (Flooring & Roofing)

Ogale Glass Works Ltd. ... Satara.

Glass Tumblers

Kaycee Industries, Ltd. ... Lahore.

Glue

Ajax Products Ltd. ... Madras.
National Sand Paper Mills (India) Ltd. Rawalpindi.

Gramophone Needles

Indian Clock Manufacturing Co., Ltd. ... Jamshedpur.

Gramophone, Trunk & Suit-case Accessories

National Metal Industries Ltd. ... Calcutta.
Hind Tank Manufacturing Co. ... Bombay.

Grinding Machines

Hind Machines Ltd. ... Howrah.
Jas. Alexander & Co., Ltd. ... Calcutta.
Chuttan Lall Mattu Mal ... Delhi.

H

Hack Saw Machines

Mysore Kirloskar Ltd. ... Mysore.

Hardware (Building)

Mapara Parekh & Co. ... Bombay.

Heat Measuring Instruments

Kaycee Industries Ltd. Lahore.

Hinges

Ram Saran Dass Aggarwal & Sons ... Jullundur City.

Hollow Wares

Khem Chand Raj Kumar ... Jullundur City.

Hoops & Strips

J. K. Iron & Steel Co., Ltd. Cawnpore.
Mysore Iron & Steel Works ... Bhadravati (South India).
Ludhiana Steel Rolling Mills ... Ludhiana.
Mukand Iron & Steel Works Ltd. ... Bombay.
Aminchand Bholanath ... Jullundur City.
Sind Iron & Steel Works Ltd. ... Karachi.

Hospital Furnitur

Ajax Products Ltd. ... Madras.
Oriental Industrial Engineering Co., Ltd. ... Calcutta.
Kirloskar Bros. Ltd. ... Satara.
Steel Equipment & Construction Ltd. ... Calcutta.
Bungo Steel Furniture Ltd. ... Calcutta.
Godrej & Boyce Manufacturing Co., Ltd. ... Bombay.
Steel Products Ltd. ... Calcutta.
Harbans Lal Malhotra & Sons, Ltd. ... Calcutta.
Hind Tank Manufacturing Co. ... Bombay.
Tin Printing & Metal Works Ltd. ... Delhi.
Anandram Mahadeolal ... Calcutta.

Hurricane Lanterns

Raghu Engineering Works Ltd. ... Delhi.
Jay Engineering Works Ltd. ... 24 Parganas.
Ogale Glass Works Ltd. ... Satara.
Harbanslal Malhotra & Sons, Ltd. ... Calcutta.

I

Ice Box

Aminchand Payarelal	...	Jullundur City.
Khem Chand Raj Kumar	...	Jullundur City.
Ram Saran Dass Aggarwal & Sons	...	Jullundur City.
Aminchand Bholanath	...	Jullundur City.
Tin Printing & Metal Works Ltd.	...	Delhi.

Ice-Cream Freezers

Aminchand Bholanath	...	Jullundur City.

Industrial Plant & Machinery

(a) Textile Machinery Equipments & Spares

Cooper Engineering Ltd.	...	Satara.
Hind Machines, Ltd.	...	Howrah.
D. K. Das & Co., Ltd.	...	Howrah.
Jas. Alexander & Co., Ltd.	...	Calcutta.
Textile Machinery Corporation Ltd.	...	Calcutta.
Howrah Trading Co., Ltd.	...	Calcutta.
Steel Products Ltd.	...	Calcutta.
Mukand Iron & Steel Works, Ltd.	...	Bombay.
Britannia Engineering Works & Foundry	...	Calcutta.
Jamshedpur Engineering & Machine Manufacturing Co., Ltd.		Tatanagar.
Bhartia Electric Steel Co., Ltd.		Calcutta.
Hind Tank Manufacturing Co.	...	Bombay.
Garlick & Co., Ltd.	...	Bombay.
Jay Engineering Works Ltd.	...	24 Parganas.

(b) Sugar Mill Machinery Equipments & Spares

D. K. Dass & Co., Ltd.	...	Howrah.
Jas. Alexander & Co., Ltd.	...	Calcutta.
Steel Products Ltd.	...	Calcutta.
Mukand Iron & Steel Works Ltd.	...	Bombay.
Jyoti Ltd.	...	Baroda.
Cooper Engineering, Ltd.	...	Satara.
Hind Machines Ltd.	...	Howrah.
Textile Machinery Corporation Ltd.	...	Calcutta.
Howrah Trading Co., Ltd.	...	Calcutta.
Britannia Engineering Works & Foundry	...	Calcutta.
Hind Tank Manufacturing Co.		Bombay.
Vasant Industrial & Engineering Works	...	Bombay.
Garlick & Co., Ltd.	...	Bombay.
Jamshedpur Engineering & Machine Manufacturing Co., Ltd.	...	Tatanagar.
Bhartia Electric Steel Co., Ltd.	...	Calcutta.
Jay Engineering Works Ltd.	...	24 Parganas.

I—*Contd.*

(c) Oil Engines

Cooper Engineering Ltd.	...	Satara.
Kirloskar Brothers, Ltd.	...	Satara.
Jamshedpur Engineering & Machine Manufacturing Co., Ltd.	...	Tatanagar.

(d) Vegetable Ghee Plant

Hind Tank Manufacturing Co.	...	Bombay.
Garlick & Co., Ltd.	...	Bombay.
Vasant Industrial & Engineering Works	...	Bombay.
Jyoti Ltd.	...	Baroda.
Hind Machines, Ltd.	...	Howrah.

(e) Power Looms and Engines

Kiloskar Brothers, Ltd.	..	Satara.
Cooper Engineering, Ltd.	...	Satara.

(f) Cement Machinery Equipment & Spares

Mukand Iron & Steel Works Ltd.	...	Bombay.
Bhartia Electric Steel Co., Ltd.		Calcutta.
Hind Tank Manufacturing Co.	...	Bombay.

(g) Pulp and Paper Machinery

Vasant Industrial & Engineering Works	...	Bombay.
Hazra Engineering Works		Calcutta.
Garlick & Co., Ltd.	...	Bombay.
Hind Tank Manufacturing Co.	...	Bombay.

(h) Soap-making Machinery

Hazra Engineering Works	..	Calcutta.
D. K. Das & Co., Ltd.	...	Howrah.
Hind Tank Manufacturing Co.	...	Bombay.
Jyoti Ltd.	...	Baroda.

(i) Mining Machinery

Jas. Alexander & Co., Ltd.	...	Calcutta.
Hind Machines, Ltd.	...	Howrah.
Hind Tank Manufacturing Co.	...	Bombay.

(j) Wood and Machinery Screw making Machinery

Victor Industries	...	Amritsar.
Indian Engineers' Corporation, Ltd.	...	Amritsar.

I—*Contd.*

(k) Wire Nail making Machinery

Indian Engineers' Corporation, Ltd. ... Amritsar.

Iron Pressings (Washerman & Tailor)

Ram Saran Dass Aggarwal & Sons ... Junllundur City.
Aminchand Bholanath ... Junllundur City.

Iron Washers

Ram Saran Dass Aggarwal & Sons ... Junllundur City.

L

Laboratory Apparatus

Kaycee Industries, Ltd. ... Lahore.

Lathes

Mysore Kirloskar, Ltd. ... Mysore.
India Machinery Co., Ltd. .. Calcutta.
Investa Machine Tools & Engineering Co., Ltd. ... Bombay.
Hind Machines, Ltd. ... Howrah.

Lathe Chucks

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Locks

Godrej & Boyce Manufacturing Co., Ltd. ... Bombay.
Aminchand Bholanath ... Jullundur City.

Lubricators

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

M

Machine Parts

D. K. Dass & Co., Ltd. ... Howrah.
Narayan Engineering ... Calcutta.
Peepul Iron & Steel Industries, Ltd. ... Cawnpore.
Engineering Works of India Ltd. ... Calcutta.
Cooper Engineering, Ltd. ... Satara.
Hind Machine, Ltd. ... Howrah.
Jas. Alexander & Co., Ltd. ... Calcutta.

M—*Contd.*

Machine Parts—*Contd.*

Textile Machinery Corporation, Ltd. ...	Calcutta.
Howrah Trading Co., Ltd. ...	Calcutta.
Steel Products Ltd. ...	Calcutta.
Mukand Iron & Steel Works, Ltd. ...	Bombay.
Britannia Engineering Works & Foundry ..	Calcutta.
B. M. Singh & Son ...	Calcutta.
Castings Corporation (India), Ltd. ...	Howrah.
Jamshedpur Engineering & Machine Manufacturing Co., Ltd. ...	Tatanagar.
P. N. Dutt & Co., Ltd. ...	Calcutta.
Bhartia Electric Steel Co., Ltd. ...	Calcutta.
Hind Tank Manufacturing Co. ...	Bombay.
Garlick & Co., Ltd. ...	Bombay.
Indian Hume Pipe Co., Ltd. ...	Bombay.
Jay Engineering Works, Ltd. ...	24 Parganas.
Usha Bolt & Nut Co. ...	Calcutta.

Machine (for making sewain)

Ram Saran Dass Aggarwal & Sons ...	Jullundur City.

Machine Tools

Cooper Engineering Ltd. ...	Satara.
Mysore Kirloskar, Ltd. ...	Mysore.
Indian Engineers' Corporation, Ltd. ...	Amritsar.
Hind Machines Ltd. ...	Howrah.
Investa Machine Tools & Engineering Co., Ltd.	Bombay.
India Machinery Co., Ltd. ...	Calcutta.
P. N. Dutt & Co., Ltd. ...	Calcutta.
Hind Tank Manufacturing Co. ...	Bombay.
Metropole Works ...	Amritsar.
Jas. Alexander & Co., Ltd. ...	Calcutta.

Meehanite Metal

Cooper Engineering, Ltd. ...	Satara.
Jay Engineering Works Ltd. ...	24 Parganas.
Indian Hume Pipe Co., Ltd. ...	Bombay.

Mild Steel Sections (Bars, Rods & Wires)

Singh Engineering Works, Ltd. ...	Cawnpore.
Radhey Lal Steel Rolling Mills ...	Cawnpore.
Ludhiana Steel Rolling Mills ...	Ludhiana.
Mysore Iron & Steel Works ...	Bhadravati (South India).
Steel & General Mills Co., Ltd. ...	Lahore.
Tata Iron & Steel Co., Ltd. ...	Calcutta.

M—*Contd.*

Mild Steel Sections (Bars, Rods & Wires)—*Contd.*

Bhartia Electric Steel Co., Ltd. ... Calcutta.
J. K. Iron & Steel Co., Ltd. ... Cawnpore.
Mukand Iron & Steel Works Ltd. ... Bombay.
National Iron & Steel Co., Ltd. ... Calcutta.
National Rolling Mills, Ltd. ... Calcutta.
Shree Hanuman Steel Rolling Mills ... Calcutta.
Indian Hume Pipe Co., Ltd. ... Bombay.
Aminchand Bholanath ... Jullundur City.
Sind Iron & Steel Works Ltd. ... Karachi.

Milling Machines.

Mysore Kirloskar, Ltd. ... Mysore.
Hind Machines, Ltd. ... Howrah.

Mining Machinery

(See Industrial Plant and Machinery)

Moulding (Cast Iron, Brass & Nickel)

Ram Saran Dass Aggarwal & Sons ... Jullundur City.
Jas. Alexander & Co., Ltd. ... Calcutta.

N

Nails (Wire)

Indian Steel & Wire Products Ltd. ... Calcutta.
National Screw & Wire Products Ltd. ... Calcutta.
Indian Engineers' Corporation Ltd. ... Amritsar.
Victor Industries ... Amritsar.

Non-ferrous metals and alloys
(a) alloys and castings

Jaipur Metal Industries Ltd. ... Jaipur.
National Screw & Wire Products Ltd. ... Calcutta.
Indian Smelting & Refining Co., Ltd. ... Bombay.
Saru Smelting & Refining Corporation ... Calcutta.
Indian Standard Metal Co., Ltd. ... Bombay.
D. K. Das & Co., Ltd. ... Howrah.
Castings Corporation (India) Ltd. ... Howrah.
Jas. Alexander & Co., Ltd. ... Calcutta.
Binani Metal Works Ltd. ... Calcutta.
Hind Tank Manufacturing Co. ... Bombay.
Indian Hume Pipe Co., Ltd. Bombay.
Aminchand Payarelal ... Jullundur City
Peepul Iron & Steel Industries Ltd. ... Cawnpore.

N—*Contd.*

(b) Aluminium.

Aluminium Corporation of India Ltd. ... Calcutta.
Jeewanlal (1929) Ltd. ... Calcutta.
Indian Standard Metal Co., Ltd. ... Bombay.

(c) Antimony

Star Metal Refinery ... Bombay.

(d) Aluminium Sheets

Kamani Metals & Alloys Ltd. ... Bombay.
Jeewanlal (1929) Ltd. ... Calcutta.

(e) Brass Plates

Kamani Metals & Alloys Ltd. .. Bombay.
Binani Metal Works Ltd. ... Calcutta.
Hindustan Metal Refinery & Rolling Mills ... Madras.

(f) Brass Sheets

Kamani Metals & Alloys Ltd. ... Bombay.
Binani Metal Works Ltd. ... Calcutta.
Hindustan Metal Rfinery & Rolling Mills ... Madras.

(g) Copper Sheets

Kamani Metals & Alloys Ltd. ... Bombay.
Hindustan Metal Refinery & Rolling Mills ... Madras.

(h) Non-Ferrous Wires & Rods

Jaipur Metal Industries Ltd. ... Jaipore.
Steel & General Mills Co., Ltd. ... Lahore.
National Rolling Mills Ltd. ... Calcutta.
National Screw & Wire Products Ltd. ... Calcutta.
Jayant Metal Manufacturing Co. ... Bombay.
Hyderabad Brass Products Ltd. ... Secundrabad (Deccan).
Jeewanlal (1929) Ltd. ... Calcutta.
Indian Standard Metal Co., Ltd. ... Bombay.

O

Office Desk Equipment

Aluminium Corporation of India Ltd. ... Calcutta.
Jeewnlal (1929) Ltd. ... Calcutta.
Hind Tank Manufacturing Co. ... Bombay.
Tin Printing & Metal Works Ltd. ... Delhi.

O—*Contd.*

Office Furniture

Godrej & Boyce Manufacturing Co., Ltd.	...	Bombay.
Aminchand Payarelal	...	Jullundur City.
Tin Printing & Metal Works Ltd.	...	Delhi.

Oil Engines (Diesel)

(See Industrial Plant & Machinery)

Oil Mill Ghannies & various parts

Peepul Iron & Steel Industries Ltd.	...	Cawnpore.
Howrah Trading Co., Ltd.	...	Calcutta.
Bhartia Electric Steel Co., Ltd.	...	Calcutta.

P

Paint & Varnishes

Jay Engineering Works Ltd.	...	24 Parganas.
Anglo Dutch Paint Colour & Varnish Works, Ltd.	...	Lahore.

Pans (Cooking & Cast Iron)

D. N. Singha & Co., Ltd.	...	Howrah.
Star Iron Works	...	Lillooah.
Khem Chand Raj Kumar	...	Jullundur City.
Ram Saran Dass Aggarwal & Sons	...	Jullundur City.
Hind Machines Ltd.	...	Howrah.
Aminchand Payarelal	...	Jullundur City.

Pans (Sugar)

Singh Engineering Works Ltd.	...	Cawnpore.
D. K. Dass & Co., Ltd.	...	Howrah.
Jas. Alexander & Co., Ltd.	...	Calcutta.
Steel Products Ltd.	...	Calcutta.
Mukand Iron & Steel Works Ltd.	...	Bombay.
Jyoti Ltd.	...	Baroda.
Cooper Engineering Ltd.	...	Satara Road.
Hind Machines Ltd.	...	Howrah.
Textile Machinery Corporation Ltd.	...	Calcutta.
Howrah Trading Co., Ltd.	...	Calcutta.
Britannia Engineering Works & Foundry	...	Calcutta.
Hind Tank Manufacturing Co.	...	Bombay.
Vasant Industrial & Engineering Works	...	Bombay.
Garlick & Co., Ltd.	...	Bombay.
Khem Chand Raj Kumar	...	Jullundur City.
Castings Corporation (India) Ltd.	...	Howrah.
Ludhiana Steel Rolling Mills	...	Ludhiana.
Jay Engineering Works Ltd.	...	24 Parganas.
Aminchand Payarelal	...	Jullundur City.

P—*Contd.*

Paper & Card-board Cutting Machine

Jyoti Ltd. ... Baroda.

Persian Wheels

Aminchand Payarelal ... Jullundur City.
Ram Saran Dass Aggarwal & Sons ... Jullundur City.
Abdul Qayum Fazal Mohhamad & Co. ... Jullundur City.
Banta Singh Shamir Singh ... Jullundur City.

Pipes

Hyderabad Brass Products Ltd. ... Secunderabad (Deccan).
Indian Hume Pipe Co., Ltd. ... Bombay.
Cactings Corporation (India) Ltd. ... Howrah.
Star Iron Works ... Lillooah.

Pipes (Reinforced Concrete)

Indian Hume Pipe Co., Ltd. ... Bombay.

Pipes (Iron)

Garlick & Co., Ltd. ... Bombay.
Mysore Iron & Steel Works ... Bhadravati (Mysore).
Tata Iron & Steel Co., Ltd. ... Calcutta.
Reliable Water Supply Service of India Ltd. Lahore.
Indian Hume Pipe Co., Ltd. .. Bombay.
D. N. Singha & Co., Ltd. ... Calcutta.

Pipe Cutters

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Pipe Wrenches

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Planning Machines

Mysore Kirloskar Ltd. .. Mysore.
India Machinery Co., Ltd. ... Calcutta.

Plates (Brass)

(See non-ferrous metals & alloys)

Plummer Blocks

Peepul Iron & Steel Industries Ltd. ... Cawnpore.
Chuttan Lal Mattu Mal ... Delhi.

P—*Contd.*

Polishing Machines

Investa Machine Tools & Engineering Co., Ltd. Bombay.
Jas. Alexander & Co., Ltd. ... Calcutta.

Porcelain Accessories

Bengal Potteries Ltd. ... Calcutta.
Khem Chand Raj Kumar ... Jullundur City.

Power looms and Engines

(See Industrial plant and Machinery)

Presses (Hydraulic & Mechanical)

Hind Machine Ltd. ... Howrah.
Mysore Kirloskar Ltd. ... Mysore.
Chhuttan Lall Mattu Mal Delhi.
Singh Engineering Works Ltd. ... Cawnpore.
P. N. Dutta & Co., Ltd. .. Calcutta.
Jas. Alexander & Co., Ltd. ... Calcutta.

Presses (Crank)

Hind Machines Ltd. ... Howrah
P. N. Dutt & Co., Ltd. ... Calcutta.

Printing Machinery

India Machinery Co., Ltd. ... Calcutta.

Pulleys

Hind Tank Manufacturing Co. ... Bombay.
Jas. Alexander & Co., Ltd. ... Calcutta.
Bhartia Electric Steel Co., Ltd. ... Calcutta.
Chuttan Lall Mattu Mal ... Delhi.

Pulp & Paper manufacturing machinery

(See Industrial Plant and Machinery)

Pumps (Centrifugal)

Jyoti Ltd. ... Baroda.
Kirloskar Brothers Ltd. ... Satara.
Reliable Water Supply Service of India Ltd. Lahore.
Kaycee Industries Ltd. ... Lahore.
Jas. Alexander & Co., Ltd. ... Calcutta.
Metropole Works ... Amritsar.

P—*Contd.*

Pumps (hand)

D. N. Singha & Co., Ltd.	...	Howrah
Jyoti Ltd.	...	Baroda.
Kirloskar Brothers Ltd.	...	Satara.
Castings Corporation (India) Ltd.	...	Howrah

Punching Presses

Mysore Kirloskar Ltd.		Mysore.

R

Railway Signalling & Interlocking Apparatus

India Electric Works, Ltd.	...	Calcutta.

Railway Stores

Kamani Engineering Corporation Ltd.	...	Bombay.
Jay Engineering Works Ltd.	...	24 Parganas.
D. K. Das & Co., Ltd.	...	Howrah
India Electric Works Ltd.	...	Calcutta.
Singh Engineering Works Ltd.	...	Cawnpore.
Tata Iron & Steel Co., Ltd.	...	Calcutta.
Jas. Alexander & Co., Ltd.	...	Calcutta.
Hind Machines Ltd.	...	Howrah.
Hind Tank Manufacturing Co.	...	Bombay.
Bhartia Electric Steel Co., Ltd.	...	Calcutta.
Indian Standard Metal Co., Ltd.	...	Bombay.
Garlick & Co., Ltd.	...	Bombay.
Indian Hume Pipe Co., Ltd.	...	Bombay.
B. M. Singh & Son	...	Calcutta.
Shaparia Dock & Steel Co., Ltd.	...	Bombay.

Re-Rolled Steel

Bhartia Electric Steel Co., Ltd.	...	Calcutta.
Indian Hume Pipe Co., Ltd.	...	Bombay.
J. K. Iron & Steel Pipe Co., Ltd.	...	Cawnpore.
Ludhiana Steel Rolling Mills	...	Ludhiana.
Mukand Iron & Steel Works Ltd.	...	Bombay.
National Iron & Steel Co., Ltd.	...	Calcutta.
National Rolling Mills Ltd.	...	Calcutta.
Radhey Lal Steel Rolling Mills	...	Cawnpore.
Shree Hanuman Steel Rolling Mills	...	Calcutta.
Singh Engineering Works Ltd.	...	Cawnpore.
Steel & General Mills Co., Ltd.	...	Lahore.
Aminchand Bholanath	...	Jullundur City.
Sind Iron & Steel Works Ltd.	...	Karachi.

R—*Contd.*

Rivets

Jeewanlal (1929) Ltd.	...	Calcutta.
Ludhiana Steel Rolling Mills.	...	Ludhiana.
Aminchand Payarelal	...	Jullundur City.
Indian Engineers Corporation Ltd.	...	Amritsar.
Victor Industries	...	Amritsar.
Universal Screw Factory	...	Amritsar.
Naraindas Industries Ltd.	...	Lahore.
Indian Steel & Wire Products Ltd.	...	Calcutta.
Khem Chand Raj Kumar	...	Jullundur City.
D. K. Das & Co., Ltd.	...	Howrah.
Jas. Alexander & Co., Ltd.	...	Calcutta.
Mantri Machinery Factory Ltd.	...	Calcutta.
Hind Tank Manufacturing Co.	...	Bombay.
Ram Saran Dass Aggarwal & Sons	...	Jullundur City.
Aminchand Bholanath	...	Jullundur City.

Road Rollers

Cooper Engineering Ltd.	...	Satara Road.
Howrah Trading Co., Ltd.	...	Calcutta.
Hind Machines Ltd.	...	Howrah.

Rolls

Jamshedpur Engineering & Machine Manufacturing Co., Ltd.	...	Tatanagar.

Rolling Mills

Jamshedpur Engineering & Machine Manufacturing Co., Ltd.	...	Tatanagar.
Hind Machines Ltd.	...	Howrah.

Ropeways (Mountings for)

Howrah Trading Co., Ltd.	...	Calcutta.
Garlick & Co., Ltd.	...	Bombay.

Rotary Core Making Machines

Investa Machine Tools & Engineering Co., Ltd.		Bombay.

S

Safes & Strong Doors

Godrej & Boyce Manufacturing Co., Ltd.	...	Bombay.
Bungo Steel Funiture Ltd.	...	Calcutta.
Ajax Products Ltd.	...	Madras.

S—*Contd.*

Safe Deposit & Vault Equipment

Godrej & Boyce Manufacturing Co., Ltd. Bombay.

Salamanders

Aminchand Bholanath ... Jullundur City.

Sanitary Equipment

Indian Enamel Works Ltd. ... Bombay.
Bengal Potteries Ltd. ... Calcutta.
Madras Enamel Works Ltd. ... Madras.
Britannia Engineering Works & Foundry ... Calcutta.
Abdul Qayum Fazal Mohammad & Co. ... Jullundur City.
Bombay Brass Works Co. .. Jullundur City.
Aminchand Payarelal ... Jullundur City.
Hind Tank Manufacturing Co. ... Bombay.
Aminchand Bholanath ... Jullundur City.

Screws (Machine & Wood)

Indian Engineers' Corporation Ltd. ... Amritsar.
Universal Screw Factory ... Amritsar.
Naraindas Industries Ltd. ... Lahore.
National Screw & Wire Products Ltd. ... Calcutta.
Shree Jam Wire Products Co., Ltd. ... Bombay.
Jagjit Engineering Works ... Kapurthala.
Hind Screws ... Delhi.
Victor Industries ... Amritsar.

Screw Cutting Lathes

Cooper Engineering Ltd. ... Satara Road.

Screw Cutting Machines

Peepul Iron & Steel Industries Ltd. ... Cawnpore.
Victor Industries ... Amritsar.
Indian Engineers' Corporation Ltd. ... Amritsar.
India Machinery Co., Ltd. ... Calcutta.

Screw Plates

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Screw Presses

P. N. Dutt & Co., Ltd. ... Calcutta.

Self-closing Water Taps

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

S—*Contd.*

Sewing Machine

Jay Engineering Works Ltd. ... 24 Parganas.

Shafts

Hind Tank Manufacturing Co. ... Bombay.
Garlick & Co., Ltd. ... Bombay.
Jas. Alexander & Co., Ltd. ... Calcutta.

Shaft-Collars

Peepul Iron & Steel Industries Ltd. ... Cawnpore.
Chuttan Lall Mattu Mal ... Delhi.

Shaft Couplings

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Shaping Machines

Copper Engineering Ltd. ... Satara Road.
Mysore Iron & Steel Works ... Bhadravati (Mysore).
India Machinery Co., Ltd. .. Calcutta.

Shearing & Punching Machines

Investa Machine Tools & Engineering Co., Ltd. ... Bombay.

Sheets

Hyderabad Brass Products Ltd. ... Secunderabad (Deccan).
Aluminium Corporation of India Ltd. ... Calcutta.
Jayant Metal Manufacturing Co. ... Calcutta.
Jeewanlal (1929) Ltd. ... Calcutta.
Kamani Metals & Alloys Ltd. ... Bombay.
Hindustan Metal Refinery & Rolling Mills ... Madras.

Sheets (Brass)

(See non-ferrous Metals & Alloys)

Sheets (Copper)

(See non-ferrous Metals & Alloys)

Sheet Metal Wares

Khem Chand Raj Kumar ... Jullundur City.
Bharat Sheet Metal Industries Ltd. ... Calcutta.

S—*Contd.*

Ships Steamers & other sea-going vessels

Scindia Steam Navigation Co., Ltd. ... Bombay.
Shaparia Dock & Steel Co., Ltd. ... Bombay.
Bombay Steam Navigation Co., Ltd. ... Calcutta.
Hind Tank Manufacturing Co. ... Bombay.

Silicon Sheets

Tata Iron & Steel Co., Ltd. ... Calcutta.

Sliding Surfacing Lathes

Cooper Engineering Ltd. ... Satara Road.

Slotting Machines

India Machinery Co., Ltd. ... Calcutta.
Investa Machine Tools & Engineering Co., Ltd. Bombay.

Sluice Valves

Chhuttan Lall Mattu Mal ... Delhi.
Peepul Iron & Steel Industries Ltd. ... Cawnpore.
D. K. Dass & Co., Ltd. ... Howrah.
Kirloskar Brothers Ltd. ... Satara.
G. T. R. Co., Ltd. ... Calcutta.
Hind Machines Ltd. ... Howrah.

Small Tools

Indian Tool Manufacturers Ltd. ... Bombay.
Peepul Iron & Steel Industries Ltd. ... Cawnpore.
Bharat Tool Manufacturing Co. Ltd. ... Bombay.
Kamani Engineering Corporation Ltd. ... Bombay.
Dolohar Ltd. ... Calcutta.
Hind Machine Ltd. ... Howrah.

Soap Making Macinery

(See Industrial Plant & Machinery)

Spindles

Mukand Iron & Steel Works Ltd. ... Bombay.
Textile Machinery Corporation Ltd. ... Calcutta.
Hind Machines Ltd. ... Howrah.

Spraying Guns (Metal)

Metal Spraying Products ... Calcutta.

Spray Pumps

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Spring Steel

Mukand Iron & Steel Works Ltd. ... Bombay.
Bhartia Electric Steel Co., Ltd. ... Calcutta.

Spring Washers

Hind Tank Manufacturing Co. ... Calcutta.

Stair Case (Spiral)

D. N. Singha & Co., Ltd. ... Bombay.

Steel (Alloy & Tool)

Mukand Iron & Steel Works Ltd. ... Bombay.
Tata Iron & Steel Co., Ltd. ... Calcutta.
Bhartia Electric Steel Co., Ltd. ... Calcutta.
Mysore Iron & Steel Works ... Bhadravati (Mysore).
Indian Hume Pipe Co., Ltd. ... Bombay.

Steel Security Equipment

Kirloskar Brothers Ltd. ... Satara.
Steel Equipment & Construction Ltd. ... Calcutta.
Ajax Products Ltd. ... Madras.
Bungo Steel Furniture Ltd. ... Calcutta.
Godrej & Boyce Manufacturing Co., Ltd. ... Bombay.
Steel Products Ltd. ... Calcutta.
Harbans Lal Malhotra & Sons Ltd. ... Calcutta.
Hind Tank Manufacturing Co. ... Bombay.
Jas. Alexander & Co., Ltd. ... Calcutta.

Storage Bins & Racks

Godrej & Boyce Manufacturing Co., Ltd. ... Bombay.

Strainers

Reliable Water Supply Service of India Ltd. Lahore.
Hind Tank Manufacturing Co. ... Bombay.
Metropole Works ... Amritsar.
Garlick & Co., Ltd. ... Bombay.

Structural Works

Kushumika Iron Works Ltd. ... Calcutta.
Victory Engineering Works ... Calcutta.
Hindustan Contruction Co., Ltd. ... Bombay.

S—*Contd.*

Steel Equipment & Construction Ltd.	...	Calcutta.
Structural Engineering Works Ltd.	...	Bombay.
Howrah Trading Co., Ltd.	...	Calcutta.
Steel Products Ltd.	...	Calcutta.
Singh Engineering Works Ltd.	...	Cawnpore.
Garlick & Co., Ltd.	...	Bombay.
Jas. Alexander & Co., Ltd.	...	Calcutta.
Hind Machines Ltd.	...	Howrah.
Hind Tank Manufacturing Co.	...	Bombay.
Mapara Parekh & Co.	...	Bombay.
Mysore Iron & Steel Works	...	Bhadravati (Mysore).
Metropole Works	...	Amritsar.
Indian Hume Pipe Co., Ltd.	...	Bombay.
Shaparia Dock & Steel Co., Ltd.	...	Bombay.

Sugar Machinery Parts

Peepul Iron & Steel Industries Ltd.	...	Cawnpore.

Sugar Mill Machinery

(See Industrial Plant & Machinery)

Suit Cases

Ram Saran Dass Aggarwal & Sons	...	Jullundur City.

Swivel Vices

Peepul Iron & Steel Industries Ltd.	...	Cawnpore.

T

Tanks

Hind Tank Manufacturing Co.	...	Bombay.
United Iron & Steel Corporation Ltd.	...	Calcutta.
Structural Engineering Works Ltd.	...	Bombay.
Singh Engineering Works Ltd.	...	Cawnpore.
Steel Products Ltd.	...	Calcutta.
Jas. Alexander & Co., Ltd.	...	Calcutta.
Hind Machines Ltd.	...	Howrah.
Jyoti Ltd.	...	Baroda.
Mapara Parekh & Co.	...	Bombay.
Indian Hume Pipe Co., Ltd.	...	Bombay.
Shaparia Dock & Steel Co., Ltd.	...	Bombay.
Howrah Trading Co., Ltd.	...	Calcutta.
Garlick & Co., Ltd.	...	Bombay.
Tin Printing & Metal Works Ltd.	...	Delhi.

T—Contd.

Taps & Dies

Peepul Iron & Steel Industries Ltd. ... Cawnpore.
Bharat Tool Manufacturing Co., Ltd. ... Bombay.

Tap Wrenches

Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Technical Precision Instruments

Kaycee Industries Ltd. ... Lahore.
India Electric Works Ltd. ... Calcutta.

Telegraph Equipments, Instruments & Accessories

India Electric Works, Ltd. ... Calcutta.

Telephone Sets & Accessories

Jay Engineering Works Ltd. ... 24 Parganas.
India Electric Works Ltd. ... Calcutta.

Textile Looms

Cooper Engineering Ltd. ... Satara Road.

Textile Machinery

(See Industrial Plant & Machinery)

Thermoflasks

Kaycee Industries Ltd. ... Lahore.
Peepul Iron & Steel Industries Ltd. ... Cawnpore.

Tin-Can Manufacturing Machines

P. N. Dutt & Co., Ltd. ... Calcutta.

Tin Containers

Tin Printing & Metal Works Ltd. ... Delhi.
Aminchand Payarelal ... Jullundur City.
Khem Chand Raj Kumar ... Jullundur City.
Hind Tank Manufacturing Co. ... Bombay.
Mapara Parekh & Co. ... Bombay.
Aminchand Bholanath ... Jullundur City.
Hind Machines Ltd. ... Howrah.

Tool Steel

Mukand Iron & Steel Works Ltd. ... Bombay.

T—*Contd.*

Transformers

Kaycee Industries Ltd. Lahore.

Tri Cycles

Mapara Parekh & Co. ... Bombay.

Trucks & Trolleys

Jas. Alexander & Co., Ltd. ... Calcutta.
Hind Machines Ltd. ... Howrah.
Hind Tank Manufacturing Co. ... Bombay.
Tin Printing & Metal Works Ltd. ... Delhi.

Trunks

Ram Saran Dass Aggarwal & Sons ... Jullundur City.

Tubular Metal Furniture

Godrej & Boyce Manufacturing Co., Ltd. ... Bombay.
Harbanslal Malhotra & Sons Ltd. ... Calcutta.
Kirloskar Bros. Ltd. ... Satara.
Ajax Products Ltd. ... Madras.

Tubs

Ram Saran Dass Aggarwal & Sons ... Jullundur City.
Jas. Alexander & Co., Ltd. ... Calcutta.
Tin Printing & Metal Works Ltd. ... Delhi.

U

Universal Milling Machine

Hind Machines Ltd. ... Howrah.

Utensils (Houeshold)

Kamani Engineering Corporation Ltd. ... Bombay.
Khem Chand Raj Kumar ... Jullundur City.
Saru Smelting and Refining Corporation ... Calcutta.
Bengal Metal Works Ltd. ... Calcutta.
Britannia Engineering Works & Foundry ... Calcutta.
Indian Enamel Works Ltd. ... Bombay.
Madras Enamel Works Ltd. ... Madras.
Jeewanlal (1929) Ltd. ... Calcutta.
Jamnadas Bros. ... Calcutta.
Hyderabad Brass Products Ltd. ... Secunderabad (Deccan).
Mysore Premier Metal Factory ... Madras.
Hindustan Metal Refinery & Rolling Mills ... Madras.
Tin Printing & Metal Works Ltd. ... Delhi.

V

Vegetable-Ghee Plant

(See Industrial Plant & Machinery)

Vehicle Equipment

Victory Engineering Works	Calcutta.
Steel Equipment & Construction Ltd.	Calcutta.
D. K. Das & Co., Ltd.	Howrah.
Jas. Alexander & Co., Ltd.	Calcutta.
Hind Machines Ltd.	Howrah.
Hind Tank Manufacturing Co.	Bombay.

Vices

Dolohar Ltd.	Calcutta.
India Machinery Co., Ltd.	Calcutta.
Hind Machines Ltd.	Howrah.
Indian Tool Manufacturers Ltd.	Bombay.
Bharat Tool Manufacturing Co., Ltd.	Bombay.

W

Water Heaters

Ram Saran Dass Aggarwal & Sons	Jullundur City.

Water-Meter

Jay Engineering Works Ltd.	24 Parganas.

Water Pipe Fittings

Kamani Engineering Corporation Ltd.	Bombay.
D. N. Singha & Co.	Howrah.
Peepul Iron & Steel Industries Ltd.	Cawnpore.
Hind Tank Manufacturing Co.	Bombay.
Indian Hume Pipe Co., Ltd.	Bombay.
Aminchand Bholanath	Jullunder City.
National Metal Industries Ltd.	Calcutta.

Weigh Bridges

Star Iron Works	Lilooah.
India Machinery Co., Ltd.	Calcutta.

Weighing Machines

Star Iron Works	Lilooah.
India Machinery Co., Ltd.	Calcutta.

Weights & Measures

Khiali Ram Gujjar Mall ... Montgomery (Pb).

Welding

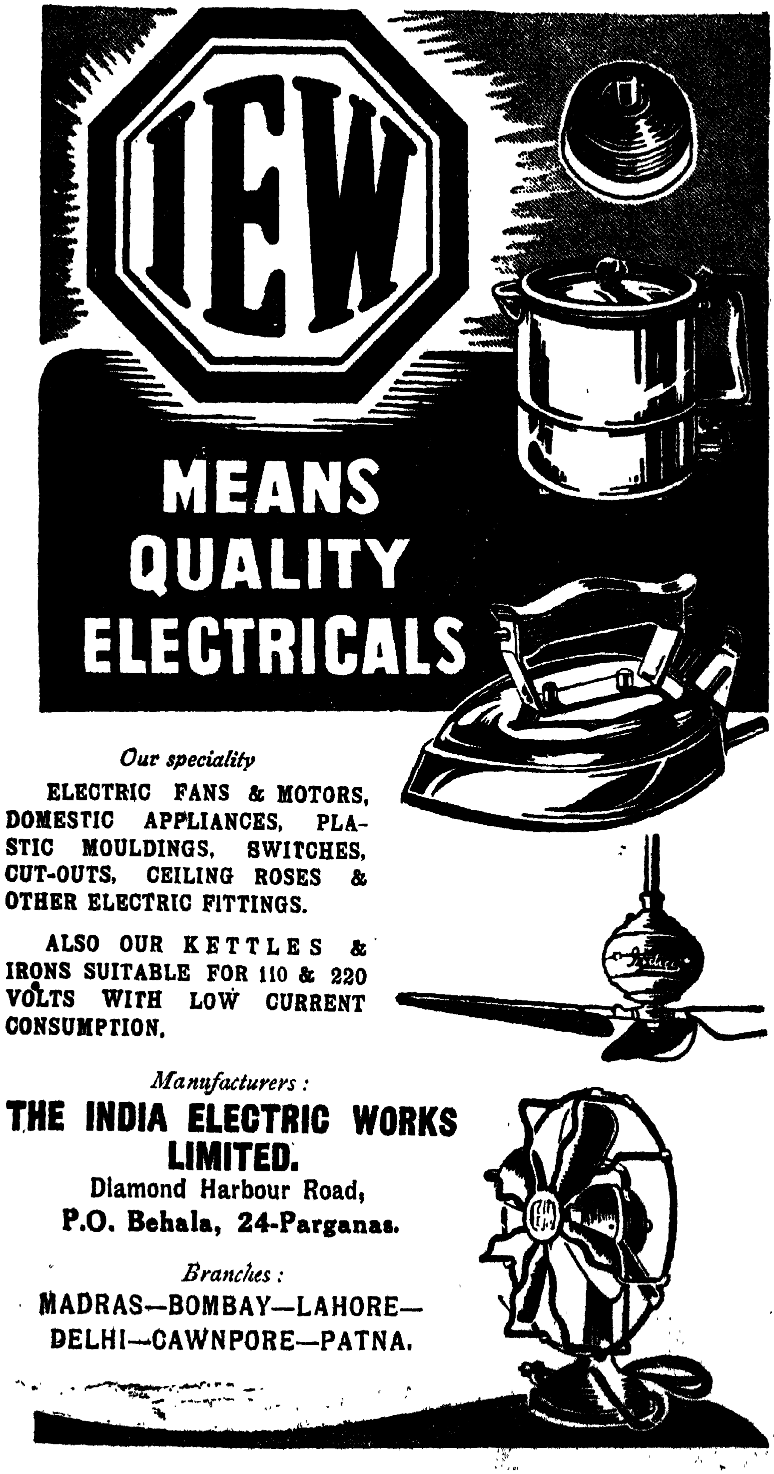
Howrah Trading Co., Ltd. ... Calcutta.
Jas. Alexander & Co., Ltd. ... Calcutta.
Garlick & Co., Ltd. ... Bombay.
National Metal Industries Ltd. ... Calcutta.

Wire & Rods

(See 'Mild Steel Sections')

Wire (Steel)

Indian Hume Pipe Co. Ltd. Bombay.
Indian Steel & Wire Products Ltd. Calcutta.
National Screw & Wire Products Ltd. Calcutta.
Mukand Iron & Steel Works, Ltd. Bombay.


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IRON AND STEEL INDUSTRY

Introduction.—The Iron and Steel Industry in India comprises of two sections: The basic industry and the steel re-rolling industry. The basic industry is in the hands of main producers who manufacture steel by using the Besslmer Open Hearth Process. They melt the iron ore, make pig iron out of which they manufacture steel, whereas the re-rollers use only scrap and many of the important units in the section of the industry are equipped with electric furnaces to make steel from scrap by electric process. In this section we have examined only the basic steel industry leaving the re-rolling industry to the section that immediately follows.

The First Success.—The credit for the successful manufacture of steel on a large scale goes to the industrial genius, Jamshedji Tata. The long and laborious efforts of Jamshedji, his sons and associates resulted in the establishment at Sakchi (now known as Jamshedpur) in 1907 of what is known as the Tata Iron and Steel Co., Ltd. The actual construction of the works began in 1908 in a jungle between Subranrekha and Khorkai rivers in the District of Chota Nagpur in Bihar. This particular site was selected after a process of elmination in consultation with the American Engineer the late Mr. C. P. Perin and Mr. Weld of the firm of Messrs. Julian Kennedy and Sahlin & Co., of the U. S. A. The site was selected near Mayurbhanj territory where rich iron ore deposits existed as reported by the late geologist P. N. Bose. It must be mentioned in this connection that the late Mr. Perin took a paternal interest in the growth of the works till his death. The works at Sakchi had the advantage of proximity to iron ore, coal, lime-stone, water, railway, and comparative nearness to the port of Calcutta. The place was the most suitable point of assembly for all the necessary raw materials. Coal was obtained from Jharia Coal fields at a distance of 115 miles, iron ore from company's iron ore mines at Guru Maishini at a distance of 45 miles and Dolomite and refractory material from a distance of 40 miles.

The Tata Iron and Steel Co. has the advantage of having its own iron ore mines at Noamundi in Bihar and at Guru Maishini Badampahar and Sulaipat in the State of Mayurbhanj in Orissa at distances ranging between 40 and 80 miles from Jamshedpur and its collieries some 105 to 110 miles away.

The construction of the plant was completed and the first pig iron was produced in 1911 and the first steel in 1912.

Later developments of the Tata and Steel Co. will be found in the description of the company given in a later section in this publication.

The Second Iron & Steel Works.—Next in volume of production come the Indian Iron and Steel Co. and the Steel Corporation of Bengal. The Indian Iron and Steel Co. was floated in 1918, but later on was amalgamated with the Bengal Iron Co. in 1936. The capacity of the newly amalgamated Company was 850,000 tons of pig iron and 100,000 tons of cast iron pipes, sleepers and general iron castings per annum. In 1939-40 the actual pig iron production of the Indian Iron and Steel Co. was 6,45,400 tons. The Company obtains its ore from deposits in the Singhbhum District near Manharpur, (B. N. R.), and Gua. A portion of the Company's coal supply, is met from their own collieries in the Ranigunj coalfields area and the Jharia coalfields. The Company has fairly large reserves of coal in other areas adjacent to the works, but not yet developed. Their requirement of limestone is obtained from Bisra Stone & Lime Co. and other parties. The Company has got its own coke ovens at Hirapur and Kulti, the capacity of which is about 63,000 tons per month. It is understood that they are modernising their coke ovens by installing a new set of batteries and ancillary plant. The Company is greatly interested in steel through its close association with the Steel Corporation of Bengal. It supplies the Steel Corporation with hot metal required for converting into steel. The commencement of operation of a new Duplex Plant at Napuria (Steel Corporation's Works), which has begun functioning from February 1946, will double the requirement of of hot metal from Hirapur and Kulti furnaces when in full operation. The Company has had in mind complete remodelling of the Works at Kulti which is very old and out of date and uneconomical. The plans of the Company are to remodel, on modern lines, the foundries which constitute the major activity at these Works. Towards this end a modern Stanton Spun Pipe Plant at an estimated cost of Rs. 60 lakhs has been installed in place of the old pipe foundries. The new plant has just commenced

operation. Other major items of remodelling extend over a period of 5 years or so.

The amalgamation of the Indian Iron and Steel Co. with the Bengal Iron Co., made it possible for the Steel Corporation of Bengal to come into existence in 1937 and set up a steel plant adjacent to the blast furnaces of the Indian Iron and Steel Co. The new steel plant commenced production on the 10th November, 1939. The Steel Corporation of Bengal take hot metal from the Indian Iron and Steel Co. under an arrangement and produce structurals, heavy rails, sheets (black and galvanised), bars, spring steel and tool steel to certain specifications. The capacity of the Works is about 200,000 to 250,000 tons per annum.

There is working arrangement between the Tata Iron and Steel Co. and the Steel Corporation of Bengal in regard to the sale of common products, which came into force in December 1939. The arrangement has been working satisfactorily. Before the Steel Works could get over their initial trouble, they had to meet types and qualities of steel different from those normally expected. This meant extensions to their existing plant as well as building new plant in certain instances, but the plant required for the expansion did not arrive in time, holding up completion of their new Duplex Plant. With the coming into full operation of the Duplex Plant, it is expected that their production will be more than doubled as compared to their original capacity. The design and layout of the plant, it is understood, will permit of further expansion if and when necessity arises. Besides the usual kinds of steel sections such as bars, sheets etc., the Works produce shell steel required for the manufacture of shells and explosives.

The Third Main Producer of Steel.—The third main producer of iron and steel is the Mysore Iron and Steel Works at Bhadravati. About the year 1920 the Mysore Government erected the works with a productive capacity of 28,000 tons of charcoal pig iron per year. A surplus was left after being used for cast iron pipes and to take care of the surplus a steel plant was added in 1934. It is understood that the maximum capacity of the rolling mills is 28,000 tons of light structurals and bars. There is also a rod and strip mill with a capacity of 5,000 tons of hoops and 5,000 tons of rods 1/4″ and below.

Deposits of iron ore, limestone and other raw materials are all the property of the Mysore State who own and run this Iron and Steel Factory. Charcoal is obtained from forests which again are the property of the State. To meet war-time and post-war demand for certain products, not manufactured in India, an open hearth and an electric furnace have been added. As there is not enough pig iron and scrap to utilise the surplus capacity for steel, an electric pig iron furnace is proposed to be added. It is also likely that the production of Ferro Alloys besides Ferro Silicon will be undertaken.

Location of Industry.—The basic Indian Iron and Steel industry is located principally in the Province of Bihar, Bengal and the Mysore State. The Iron and Steel is a highly localised industry and affords good example of the marked advantages of a suitable location. A heavy industry like iron and steel is attracted to the place where iron ore and coal the two most important raw materials are situated. The raw materials required for the iron and steel industry are iron ore, coal and water, lime-stone, fluxes and dolomite etc. Iron ores are found in abundance in Bihar, Orissa, Mysore and Goa. But some of the richest iron ore deposits of the world exist in the Iron Belt which comprises the Singhbhum area in which the Tata Works are located. In respect of coal the Indian Steel Industry enjoys exceptional advantages because they are available within a short distance from the iron ore deposits. Ample deposits of limestone and dolomite are also available in the neighbourhood.

•The principal centres of the industry in order of importance on the basis of the number of workers employed in 1939 were as follows:—

ame of the Province.	Number of workers (in thousands).
Singhbhum (Bihar)	22·9
Burdwan (Bengal)	16·0
Shimoga (Mysore)	3·0
Howrah (Bengal)	0·6
Manbhum (Bihar)	0·4
24 Parganas (Bengal)	0·3

From the locational point of view, C. P. offers certain advantages and enterprising Indian industrialists may devote their attention to the establishment of a steel works in the Central Provinces. The Provincial Industries Committee in their Report write thus:—

Iron ores are widely distributed throughout the province, which is now perhaps the chief home in India of iron smelting in small indigenous blast furnaces. These furnaces are however now on the decline as will appear from the fact that, while in 1909 Bilaspur had 103, Drug 56 and Raipur 230 of them, in 1937 they had only 59, 6 and 3, respectively. The ore occurs chiefly in the Narsinghpur Sub-Division of the Hoshangabad district and in the Chanda, Drug and Jubbulpore districts.

No quantitative estimate of the Narsinghpur or Jubbulpore ore has yet been made.

In the Chanda district, the best known deposits are found in Lohara near Chanda, where the iron ore forms a hill 650 yards long, 200 yards wide and 120 feet high and has been traced for a further distance of 2½ miles, with an estimated reserve of roughly two million tons. These ores are of very high quality as can be seen from Statment No. VII annexed.

In the Drug district the deposits occur chiefly in the Dondi-Lohara Zamindari in the south in the shape of conspicuous hillocks. The most striking of these is the ridge which includes the Dalli and Rajahara hills, extending for some 20 miles in a zigzag, almost continuous line, and rising to heights of sometimes 400 feet above the general level of the flat country around. Sixty-four samples have been subjected to careful analysis and the average results obtained for the surface samples were iron 66·35, phosphorus 0·058, sulphur 0.108, silica 1·44 and manganese 0·151 per cent, while for the cores (deeper layers) the averages were iron 68·56, phosphorus 0·64, sulphus 0·071, silica 0·71, and manganese 0.175 per cent. Prospecting operations have proved the existence of 2·6 million tons of ore carrying about 67·5 per cent of iron and a phosphorus content slightly below the Bessemer limit. The quantity estimated is that which may be regarded as ore in sight while

almost certainly much larger quantities may be obtained by continuation of the ore-bodies beyond their proved depth.

The total reserves in the Dondi-Lohara Zamindari have been estimated to be of the order of 114 million tons.

India has for long been famous as a manufacturer of iron and steel. "Casting iron", says Professor Wilson, "is an art that is practised in this manufacturing country (England) only within a few years. The Hindus have the art of smelting iron, of welding it, and of making steel, and have had these arts from time immemorial". The late Mr. Ranade in his Essays on Indian Economics wrote:—

> "The iron industry not only supplied all local wants, but it also enabled India to export its finished products to foreign countries. The quality of the material turned out had also a world-wide fame. The famous Iron Pillar near Delhi, which is at least fifteen hundreed years old, indicates an amount of skill in the manufacture of wrought iron, which has been the marvel of all who have endeavoured to account for it. Mr. Ball (late of the Geological Survey of India) admits that it is not many years since the production of such a pillar would have been an impossibility in the largest factories in the world, and, even now, there are comparatively very few factories where such a mass of metal could be turned out. Cannons were manufactured in Assam of the largest calibre, Indian Wootz or steel furnished the materials out of which Damascus blades with a world-wide reputation were made; and it paid Persian merchants in those old times to travel all the way to India to obtain these materials and export them to Asia. The Indian steel found once considerable demand for cutlery even in England. This manufacture of steel and wrought iron had reached a high perfection at least two thousand years ago."

There is a record that steel was exported to Glasgow from South India in the middle of the last century and that it was of a better quality than that made in the United Kingdom.

At present the steel industry of India is practically in the hands of two or three large manufacturers; in the Central Provinces itself no iron or steel is made by modern methods. The Indian Tariff Board in their report on this industry in 1933-34 referred to the complaints they had received about the 'monopolistic' attitude of the Tata Company. They stated that in future it would be a development greatly to be desired that steel production should not remain the practical monopoly of a single enterprise. It is therefore in the national interest that encouragement should be given to the promotion of steel industry wherever local conditions permit.

It is well known that the late Jamshedji Tata seriously considered the possibility of manufacturing steel in Chanda, but was obliged to give up the idea on account of the non-availability of coking coals in the province.

It may be of interest to mention that the Krupp-Renn process, recently tried out in Germany, makes it possible to manufacture steel direct from the ore without having to convert it first into pig-iron. The process is also independent of cooking coal, any kind of coal being suitable. Here crushed ore and carbon together with slagging material are fed into one end of a rotary kiln and loops of steel collected at the other. The loops of metal are crushed to shed the slag and the resultant product is good steel ready for being melted electrically or by the open hearth process. The process should be investigated further and if samples of Central Provinces ores are found fit for this treatment and the scheme is justified economically, plant capable of dealing with 250 to 300 tons of ore per day can be installed near the mines in the Chanda or Drug district. It is estimated that 0·4 ton of carbon will be used for every ton of ore treated and that the carbon may be in the form of soft coke or charcoal. This may justify the installation of a coal carbonisation plant dealing with 250 to 300 tons of coal a day. In this matter of carbonisation of local coals also, samples will have to be tried out both for low and high temperature carbonisation under working conditions.

The discovery of coking coals in the Mahanadi area is of very considerable interest to the future of the iron and steel industry in this province, for the principal reason why the industry

has not yet been established is the absence of coking coal in commercial quantities. The foundations of a steel industry can be laid either in the Chanda or Drug district so soon as coking coals could be made available in the requisite quantities, for the other raw materials required, *viz.*, superior iron ore, Limestone, re-fractory materials, etc. are present in abundance. Electric power could be obtained either from the local thermal stations, we visualise, or in the Drug area, from the Chitrakut Hydro-Electric Project in the Bastar Sstate, which we hope will be established as soon as possible. As has been stated in the chapter on Power, preliminary investigation revealed that there is every prospect of obtaining cheap power from this project and we recommend that the Provincial Government should arrange with the Government of India for the completion of this regional scheme without delay and claim their share of the power when it becomes available.

As there will be considerable industrial expansion, the steel produced will find a ready market.

In view of the extreme importance of the iron and steel industry in the industrial economy of India, we are of opinion that every effort should be made by Government, both by pursuing the suggestions made above and otherwise, to establish the industry in the province. Private enterprise should receive every kind of help and encouragement from Government in the establishment of the industry including, if necessary, the purchase of shares up to 51 per cent of the total capital and the nomination of Government directors."

Per-War Position.—Before the war of 1939, India was producing about 1,750,000 tons pig iron of which nearly 60% was used for making steel and the remainder was used in foundries in the country and exported outside. The chief markets for Indian pig iron were Africa, Java, Ceylon, Burma, the U. S. A., Japan and the United Kingdom. The quantity of finished steel manufactured came to about 750,000 tons per annum. In addition to the main producers who have been referred to in the preceding paragraphs there were about 50 re-rolling factories engaged in rolling steel billets and scraps into rods and bars.

In addition to the 750,000 tons of finished steel produced in India the country was importing about 150,000 tons to 300,000 tons per annum, thus bringing the total consumption of steel to nearly a million tons.

Before the war although the country had made rapid progress in the production of steel, India's place among the steel producing countries of the world was extremely low as can be evidenced from the following figures:—

STEEL INGOTS AND CASTINGS IN 1939.

Country.	*Production.* (In thousand tons)
U. S. A.	52,798
Germany.	29,617
U. S. S. R.	20,719
U. K.	15,119
France.	9,407
Japan.	7,055
Belgium.	3,429
Canada.	1,509
Sweden.	1,231
India.	750
Spain.	516

War Time Development: Additions.—Thus it would be seen that the basic Indian Iron and Steel Industry is located in Bihar, Bengal and the Mysore State. The Tata Works are self-contained. They mine their own iron ore and smelt the iron ore with coke in blast furnaces one of which holds the world's record for one day's production. The peculiarity of the Mysore plant is that it is worked up to now on charcoal instead of coke for iron smelting. During the first year of the war, Tatas added a magnesite plant for the production of pea-size magnesite and magnesite bricks. In addition to this some other extensions have also taken place, the most important of which are their Wheel and Axle plant and the Toluene plant.

Similarly, the Mysore Iron and Steel Works added a 25 ton basic furnace together with two small electric furnaces which is calculated to increase their productive capacity to well over 50,000 tons. Mysore has also manufactured ferro-silicon of the quality required for the first time in India and India may be considered self-sufficient so far as this alloy is concerned.

Out of the 10 blast furnaces working in India, 5 belong to Tatas, 1 to Mysore Iron & Steel Works and 4 to Indian Iron and Steel Co., at Hirapur and Kulti which is managed by Martin-Burn group. Just before the war, this group started the Steel Corporation of Bengal which as stated above gets its Pig Iron from the Indian Iron and Steel Co. The location of the Corporation Works at Burnpur within a short distance from the Iron Works of the Indian Iron and Steel Co., has worked to the mutual advantage of both. The Indian Iron and Steel Co., provides to the SCOB not only Pig Iron but also gas, power, water etc. The Steel Corporation of Bengal which was planned in 1936 but came into actual operation only in 1939 had only 3 basic open hearth furnaces to which one more open hearth furnaces was added in 1942. The full post-war project has not yet been completed. After its completion, it is expected to produce between 5 lacs and 6 lacs tons of steel annually. A large part of the output of the Steel Corporation has been used for rails for the Middle East, truck parts, telephone equipments, shells etc. Toullene plant has been started at Hirapur which is turning to good account a by-product which otherwise would have been wasted. The Corporation has also plans for the manufacture of alloy steels.

Manufacture of all the Railway Requirements.—Before the war wagons were manufactured in India but wheels, tyres, and axles had to be imported; with the operation of the steel and axle plant at Jamshedpur this need has been met. The Tata Engineering and Locomotive Mfg. Co., has been established to undertake the manufacture of boilers, locomotives etc., at Jamshedpur. It can be therefore said that very shortly India will be manufacturing practically everything required by the Railways.

High Silicon Sheets.—The manufacture of high silicon sheets for the requirements of the Electrical Industry of the country has already begun at Jamshedpur with the technical help of Sunkeys. These high silicon sheets manufactured by Tatas can be had either from Tatas direct or from Sunkeys.

Alloy Steel.—The most significant development during the war time has been the manufacture of alloy and tool steels. Previously the production of alloy steel was only 250 tons per month which has now reached the figure of 1,000 tons per month.

Alloy steel is the steel of the future as ordinary carbon steel is being gradually replaced in many manufacturing processes by alloy steel since the latter gives more strength for its weight and resists corrosion. India is well placed for the manufacture of alloy steel. Even before the war, low alloy steel was successfully manufactured by the Steel industry in India under the names 'Tiscor' and 'Tiscrom' but the impetus of war has given further confidence and experience in its manufacture since thousands of tons of special steels of varied specifications have been made in the country for munition purposes in electric furnaces and by other processes and it can be stated that the industry has mastered the preliminary difficulties. To alloy with steel, India has abundance of manganese, a good supply of chrome, tungsten, vanadium, titanium, berylium etc., and in normal times it can easily import the other alloy elements. The Jog Hydro-Electric Scheme in Mysore when completed will add 64,000 H. P. from Sivasamudram and Shimsa Power Station to begin with. At its first stage of operation, Jog is expected to give 32,000 H. P. by 1946, and thus help to make Mysore the centre of alloy steel and other alloys metals industry, with its cheap electric power and chrome and other minerals found in the neighbourhood. As regards further development in British India of the industry of alloy steel and other alloy metals, help is required from Government (*a*) for provision of cheap electric power, (*b*) for a pilot plant to manufacture electrodes for electric furnaces, since electrodes are a heavy item of expenditure in electric furnaces and practical research aided by Government is required to make electrode manufacture a success though many private parties have been experimenting in this line with varied results, and (*c*) for laying down specifications for Government requirements of tool steel etc., with a view to utilising the special alloy steels that can be made in the country mostly from materials available in this country. It may be stated here that the establishment of electrode industry in the country would be a great help to Aluminium Industry also. The alloy steel industry is the source of the very important industry of tool steel and machinery parts etc., and as such requires fostering by the State.

Other Achievements.—Other war time achievements of the Indian Steel Industry are high speed steels for machine tools, high carbon steels for the manufacture of mint dies and

certain other types of plain carbon for high explosive shells for ordnance purposes. The making of high carbon tool steel has already resulted in the expansion of twist drill manufacture. This may lead to the establishment of such industries as razor blades, files, cutters, knives, dies etc.

Nickel steel plates for gun carriages and a special high alloy nickel manganese steel was also manufactured during the war. The Indian Steel Industry is also manufacturing stainless steel now.

Present Position of the Steel Industry.—These war time developments have made great contribution to the war effort and have strengthened the country to meet post-war demands for materials previously imported. India has in many ways become self-supporting in regard to steel industry. The present productive capacity of the steel in the country is of the order of 12,00,000 tons and the demand for steel may be roughly taken at 20,00,000 tons. In order therefore to cope with the increase in demand of the country Iron and Steel Panel of the Government of India has recommended the establishment of a new plant with an initial capacity of 500,000 on an ultimate capacity of a million tons of ingot steel per annum which has been described in the suceeding paragraphs. From the following figures of production it will be found that the steel industry is now able to meet India's manifold demands:—

	Pre-War (Tons)	1944 (estimates) (Tons)
Structurals ...	150,000	225,000
Bars & Rods ...	150,000	222,000
Plates ...	70,000	82,000
Sheets-black & corrugated ...	150,000	183,000
Rails & Fishplates ...	120,000	149,000
Railway Fittings ...	28,000	
Tin Plate	50,000	80,000
Wire ...	10,000	17,800
Castings ...	5,000	7,000
Nails ...	10,000	14,000
Nuts & Bolts ...	5,000	29,000
Ordnance ...	2,000	30,000

Post-War Expansions.—*The Tata Iron and Steel Co.,* put into regular operation in November, 1945, a 1·5 million c.ft MAN waterless coke oven gas holder and a new Ingersoll Rand coke oven gas buster was put on commercial load in March 1946 at the East Plant Buster House.

The new products manufactured at Tatas works during 1945 included high quality sheets for deep drawing work and enamel ware, Panel plate quality sheets for automobile bodies, furniture, cycle parts, hinges etc., Armco iron, Titanium steel and 14/22 per cent Tungsten steel sheets etc. A new electric annealing furnace was put up for annealing high silicon electrical steel sheets.

The local work in connection with the 28″ billet mill at Jamshedpur is now nearly complete and the manufacture of the equipment for the mill ordered from the U. K. is reported to be proceeding satisfactorily. For technical reasons it was found necessary to reconsider the specifications of the mill for rolling the steel strip required for the manufacture of tubes. After the cessation of hostilities the Company has begun an exhaustive technical survery of the existing plants and operations at Jamshedpur. A well-known firm of American Consulting Engineers has been commissioned to undertake this work. It will put forward recommendations both for renewals and replacements necessary to bring the Jamshedpur plant up to optimum efficiency and for such other extensions as may be economically found desirable for the purpose of increasing production to the maximum within the present lay out and rendering the plant more flexible.

The Duplex Plant at the Steel Corporation of Bengal came into operation in February, 1946. There were the starting up difficulties and the Company has engaged an American expert for this class of operational work.

The Mysore Iron and Steel Works have recently finalized the following eight schemes:—

(1) A rod and strip mill at the factory,

(2) A Billet and Light structural mill,

(3) Electric Pig Iron Furnace,

(4) *Manufacture of Ferro-alloys, Refractories, Acetic Acid, and*

(5) Expansion of cement plant.

A scheme for the large-scale burning of lime-stones in modern type of kilns and the preparation of hydrated lime and other lime products, under mining development with an expenditure of Rs. 1 lakh non-recurring, and Rs. 1 lakh recurring was adopted with the observation that in case private enterprise was forthcoming it may be encouraged.

The Advisory Steel Panel.—Last year the Government of India appointed an Advisory Steel Panel to examine the future development and organisation of the Steel Industry under the Chairmanship of Sir Padamji Ginwalla. The Panel has now submitted its report. A Seven Year Plan with a target of 3 million tons of iron and steel is recommended by the Panel. The present production of finished steel of all classes including that produced in the Ordnance Factories is estimated at 12,00,000 tons. An additional tonnage of 200,000 tons is expected from the Steel Corporation of Bengal when its Duplex plant comes fully into operation. India is being rapidly industrialised and there are multi-purpose projects which are bound to consume increasingly large quantities of iron and steel. The Panel has, therefore, recommended a target production of 2½ to 3 million tons to be reached in seven years' time.

One of the important recommendations of the Panel relate to the desirability of establishing a new plant with an initial capacity of 500,000 tons and an ultimate capacity of a million tons of ingot steel per annum in Bihar or in Western Bengal. This is not now practicable because with the high capital cost of a new works which would be four to five times that pre-war cost no new works in Bihar or Bengal would be able to meet the very high-level demand of labour employed in steel industry in these Provinces.

Regarding control the views of the Panel are as follows:—

(1) Regulation and stabilisation as far as it may be practical of the prices of iron and steel which have progressively risen and have been liable to frequent changes during the last 12 years or more.

(2) On a long view it will be in the interest of the industry and of the consumer if these prices are not related to foreign prices but based on the local costs.

(3) In order that the domestic price structure may not be disturbed by foreign prices, imports of iron and steel should be prohibited except under a licence duly issued for the purpose.

(4) To prevent an artificial shortage of iron and steel in order to take advantage of high prices in the export markets exports should likewise be forbidden except under licence.

The Panel holds that there is no necessity of continuing protective duties now. Foreign competition, though it may remain dormant for some time, may revive at any moment. The protective duty should, therefore, remain on the statute book but their levy should be suspended until such time as their imposition should become necessary.

Government assistance which according to the Penel is necessary for the existing industry and for the purpose of attracting into it necessary capital falls under the following categories:—

(*i*) Minimum abrogation of the Excise Duty.

(*ii*) Maximum relief under taxation particularly from Income Tax.

(*iii*) Abolition of Equalisation Fund and all surcharges at present levied on iron and steel.

(*iv*) Reduction in Railway fares and rates.

2. Metallurgical Research.—Messrs. Tata Iron & Steel Co., maintain the Tata Control and Research Laboratories where experiments are being carried on the manufacture of Ferro Titanium, Ferro Phosphorus, Ferro Boron and exploratory work has been done on the electrolytic polish of Ferrous and non-Ferrous micro samples, etc.

As a result of researches carried on in the Tata Laboratories, it has been possible to manufacture basic refractories from low grade chrome ore, nozzles and stoppers from clay etc.

Difficulties of the Industry.—*The disparity between* the abundance of iron ore and the increasing scarcity of coking coal is the chief problem facing the industry. Coking coal in the country is calculated to last only about 50 years more and without the direct intervention of the State, the preservation of coking coal for the metallurgical industry cannot be effected. Coking coal is at present being used largely for other uses than the manufacture of coke, namely, electric power generation steam raising in locomotives and industries for which lower grade coal can be used with a little adjustment of the machinery concerned. This wasteful misuse of coking coal has to stop if metallurgical industry is to have a long lease of life. Development of hydro-electric power and generation of power from the low grade coals of Bengal and Bihar and the electrification of Railway wherever possible will also help towards presevation of coking coal. Coking coal is a national asset and its economy and preservation is of the utmost importance to the State.

Higher cost of Raw Materials and Labour.—The other difficulty to consider is that high cost of raw materials and labour even after the war, have stabilised at a very much higher level than before the war. In the special circumstances of India, wages etc., increased or supplemented to cope with rising index of prices do not tend to recede proportionately when the price index goes down, if they recede at all. Even before the war, the cost of labour per ton of steel in India was higher than in Australia, where highest wages are paid. Competing countries, therefore, have an advantage over Indian industry which advantage will increase in their favour owing to the circumstances described above and owing to the various legislative measures for the welfare of labour under the consideration of Government. To plan and build on the basis that the cost of labour per ton would be cheaper in India than in competing countries, would be misleading in the case of organised industries like steel. As regards the cost of coal per ton of steel, about 2·2 tons of coal are required for one ton of finished steel. In 1934-35 the Tariff Board considered a price of Rs. 5-12-0 per ton of coal at Steel Works as fair. The present price of coking coal is about Rs. 12 per ton F. O. R. collieries, which has shown no diminution even after the war because (*a*) the demand for coal has generally increased owing to further industrialisation of the

country; (*b*) coking coal is becoming scarcer every year; (*c*) coking coal and other coal in Bihar etc., have already to bear heavy cesses such as Jharia Water Board rate and cess, sand stowing cess, Rescue cess, Road cess, Mines Board of Health Cess, Welware Cess, etc.; (*d*) as labour legislation is effected as expected for the further promotion of welfare and total emoluments of miners, costs are bound to rise; and (*e*) many coking coal collieries are nearly exhausted. Thus one competitive advantage of cheap coal has also almost disappeared. To summarize, two important items of cost, cost of labour and cost of coal per ton of steel, are at a very much higher level to-day than before the war. Now that the war is over, after the rush of civil re-construction is over and increased capacities reached during the war are geared to peace time production, India should expect from competing foreign countries commando raids of commerce, dumping their steel, carried in American war-built surplus bottoms, armed with effective Exchange to cut into competitors' trade. During that testing time, the State will have to help the Industry to tide over the difficulty by increased protective duties and other devices.

Reduction in Transport Charges.—With increased costs of labour and coal in prospect, where can the industry look for relief? It will have to look towards the State adjusting its Railway freight policy to suit the needs of its essential industries. It is admitted that in the early years of the steel industry, Railways did much by an enlightened policy of concessional freights to place the industry on its feet. They fattened the lamb to a wholesome size and then asked for their pound of flesh, knowing the fat lamb, could not easily run away. After the steel industry was established, the Railways, knowing that the location could not be changed, took advantage of their monopolistic position and raised their rates to the ordinary wagon load level as if it was a fourth rate industry of no material importance. It was a good commercial proposition but not a wise national policy aimed to aid industrialisation. Cheap steel, as raw material, helps to establish other industries. It is a basic industry. Before the war, the industry was able to bear the raised freights owing to labour and fuel costs not having risen to their present levels. It is, therefore, time for the State to revise its freight policy towards this industry.

Revision in three directions is called for. When the industry's material is hauled in trainloads from one destination to another instead of in separate wagonloads, the cost to the Railway is very much less because in a given time, owing to relative avoidance of detention at intermediate stations, the traffic hauled would be much greater than in the case of separate wagonloads; but the Railway charges the same freight per ton when material is sent by trainloads to a destination as when it is sent there by separate wagonloads. It would be equitable if the economy effected by trainloads is largely passed on to the industry by the Railway in the shape of a special concession rate for trainloads proportionately less than for wagonloads. Secondly when essential raw materials for the industry have to be moved from long distances special consideration should be given to lessen to the industry the burden of heavy freight on such long distances. Thirdly, when there is short distance haulage, in spite of the industry giving very heavy traffic, the tendency is to impose on the industry very onerous charges in the name of terminal charges disproportionate to the actual cost incurred by the Railway and at variance with the original object of terminal charges. When an essential industry happens to be established on a commercial-minded Railway and so to say gets into its clutches, the questionable principle of "Fleece as you please" sometimes tends to masquerade under the respectable economic caption "Charge what the traffic can bear". This has to change and as all the Railways in India have come under State management, it is for Government to effect the change.

• So far as the bigger units of the steel industry are concerned, Government should also consider if they should not encourage these Companies to have their own wagons which would be used by Railways for steel Companies' transport of raw materials and finished products and convenient traffic from other sources by offering a very low special transport rate for the industry in consideration of these Companies owning their own wagons, as is done in foreign countries. It is not suggested that the whole of the steel traffic should be carried in Company owned wagons but only a part to begin with. If a net reduction in Steel industry's high transport cost becomes possible in this manner with a very low rate charged by Railways for the

haulage etc., of these companies' traffic carried in wagons belonging to these companies, it will not only tend to remedy the wagon shortage situation but it will also help the steel industry and wagon building industry in the country to fill their order books in times of post-war depression. It is estimated that to build a CR type of wagon, the following steel materials are required:—

Structural	...	...	50 cwts.
Plates	...	...	51 ,,
Bars	...	..	31 ,,
			132 cwts.

In the larger economy of transport, Government to begin with, should have the following possibilities surveyed (*a*) whether, in order to cheapen transport, it would be a business proposition to generate producer gas etc., at the coal-fields as is done in Germany and Russia and have it pumped from there to metallurgical industries etc., within a radius of 200 miles by pipes laid from the coal-fields to consuming centres instead of sending gas coal etc., from coal-fields to these centres in wagons which have to return empty, as there is no return traffic to carry to the coal-fields; (*b*) whether it would pay the Railways to reduce the present tare weights and correspondingly increase the pay load of wagons by building lighter wagons with steel sections already made in India (*c*) whether for goods traffic towards Calcutta an alternate navigable water route would be practicable as a business proposition or as a measure of strategy useful in war, from the Jamshedpur industrial area running east-ward towards the Rup Narain River (35 miles from Calcutta) or towards the sea by deepening and broadening the channel of any existing river or by building a canal or by a combination of these agencies. All these transport facilities may not be practicable in India owing to natural and other difficulties. But as, in order to accelerate the pace of industrialisation, the country is anxious to broaden and cheapen its transport on the lines of what has been done in the west, it would be desirable to have these subjected to a preliminary survey and expert opinion obtained.

RATIONALISATION.

The Rationalisation in the steel industry as practised before the control order of 1941 was mainly on the distribution side, there being a working arrangement between the iron manufacturers including Mysore to sell their iron at agreed rates and there being an actual pooling of sale of steel through a common selling organisation between the Tata Company and the Steel Corporation of Bengal. There is no rationalisation on the production side but with the lifting of controls as the output of the two Works increases, necessitating further diversification of their products, rationalisation will tend to reach out to the production side so that duplication may be avoided and instead of both making a low tonnage at high cost of the same product, rationalisation would suggest division of work, each Company specialising in a particular product and producing it at an economic level. Time is not ripe to visualise the economy of a merger between these two Companies. As Tata Company owns most of its raw materials and as Steel Corporation gets its iron from Indian Iron and Steel Co., under a special agreement, avenues to further rationalisation are limited and in the immediate future rationalisation cannot be looked forward to as a reducing factor either of their operation cost or of overheads.

Thus to meet the onslaught of fierce competition after the war, the industry cannot look forward to either reduction in the cost of coal or labour to prewar levels or to any form of rationalisation. It will have to rely mainly on the economics of large scela priduction by up-to-date machinery and on discarding readily its obsolete units of production. What was not obsolete before the war tends to become obsolete now, for in the five years of war, the metallurgical industry abroad has progressed more than it would have done normally in twenty years. But obsolete machinery cannot be scrapped easily unless Government in the special circumstances prevailing, revise generously the obsolescence rate under the Income Tax Act. Therefore to stand unshaken in the aftermath of war, the industry will require the help of Government for adequate protection and revision of its policy of income tax obsolescence rate and an exchange policy adequate to guard the industry against unfair competition from outside.

CONTROL ON DISTRIBUTION AND PRICES.

After the war broke out the demand for iron and steel rose considerably and the steel industry was called upon to step up its production which could not be possible to the extent desired on account of coal and labour shortage. Hence the necessity for rationalising steel distribution.

Soon after the outbreak of the War Government appointed an Adviser on Steel Supplies who later on became the Iron and Steel Controller with the promulgation of the Iron and Steel (Control of Distribution) Order in 1941. After some time production of iron and steel was also brought under control. A Board was also constituted to administer the Control scheme, wherein were represented the main producers, re-rollers, fabricators, quota holding authorities, M. G. O., Finance Department of Government etc. An elaborate system of planning of production and distribution of iron and steel through a system of licences was introduced. From July 1944 Government introduced price control also under which steel comprising most of the categories of production was to be issued at uniform rates to all the parties irrespective of whether they were Government Departments or other license holders. The main producers' war supply contract with Government remained unaffected by the issue of the controlled price lists as they had to refund or get back from Government according as the issue prices were higher or lower than the war contract prices. The same position continues even now. The prices at which steel materials were purchased by Government in India were very fair and this has been confirmed by the Select Committee of Parliament in U. K. on National Expenditure in the following terms:—

"A further illustration of price movements is given by the figures calculated from the wholesale prices of eleven articles of food. Taking the prices ruling in August 1939, for these eleven foodstuffs as equivalent to 100, the average figure for the remainder of 1939 was 112·2, for 1940 it was 107·3, for 1941 117.1, for 1942 155.8, for 1942 257.7 and for 1944 it had dropped slightly to 234."

These figures contrast sharply with the prices negotiated for steel. The India Office state that soon after the outbreak

of war a contract was concluded with the main producing company for the supply of steel required for war purposes at prices (known as war contract prices) equivalent to the imported prices then current. These prices were to apply for a period of six months from 1st October, 1939. Thereafter, and for the duration of the war, prices were to be determined anew by negotiation between the company and the Government for every succeeding six-monthly period; increases and reductions were to be related to changes in the costs of production. Actually, no price increases were claimed during the first three years of the war, and present rates for war contracts are about 27 per cent over pre-war rates. More than 50 per cent of the expenditure incurred on the requirements of the Indian Supply Department represents cost of steel. Steel not required for war purposes is sold at commercial rates; and, in fact, Civil Departments of the Government of India are paying more for Indian Steel than are His Majesty's Government."

Imports.—Up to 1912 India was dependent on imports from abroad for all her steel requirements. U. K., Europe and to a small extent U. S. A. participated in the trade. The imports of steel reached a peak figure of 1,450,000 tons in 1927-28. When Indian industry began to develop, imports fell gradually and went down to 400,000 tons in 1936-37 and to 162,000 tons in 1938-39. The country is still not self-sufficient and has to depend on imports.

It is unfortunate that in spite of the increased industrialisation, the consumption of steel in India has not gone up and has been static in the region of about 1 million tons on an average per annum for the last 30 years. This is particularly attributable to the acute poverty of the people and backwardness of Indian industries. Being a country predominantly with an agricultural economy, very slow progress has been made in the development of the Iron and Steel industry. The population of India has been increasing every year by 5 millions. Even though many new industries have been established under the exigencies of war and old ones reconstituted, the volume and

value of production have been small compared to the size of the country and its population, as the following figures shown:—

—		Area in sq. miles.	Population	Production of Steel ingots and Castings.	Per Capita production per annum
U. S. A....	...	17,839,000	136,497,000	81,160,000	0·58
U. K. ...	...	244,000	48,182,000	13,239,000 (1943)	0·27
Canada ...	...	19,569,000	11,812,000	2,744,000	0·23
India ...	...	4,096,000	388,998,000	1,600,000 (1943)	0·004
U. S. S. R.	...	21,175,000	172,000,000	21,000,000 (1941)	0·12

PRICE AND PROTECTION.

There is a wrong notion in the minds of people that Indian Steel consumers have to pay higher prices for Indian steel. The notion has gained currency because of the fact that the steel industry has been a protected industry since 1924. But if we analyse the facts as they are we would come to the conclusion that Indian steel is selling much cheaper than British steel and that protection has not been a burden on the consumer. But we believe in the near future Australian competition would become effective in India as the Australian costs of coal and labour per ton are lower than in India and India may look to Australia in the near future for the supply of semis like billets etc. for its re-rolling industry.

It will be recalled that the Government granted protection to the Steel Industry in 1924 partly by import duties which were first reduced in 1927 and again in 1934, and partly by granting subsidies which were removed in less than 3 years of their inception. The protective duties were due to expire on 31st March, 1941 but Government decided to continue them for reasons of war.

The protection referred to above has not been a burden on the steel consumers because the additional revenue accrued to government from the protected steel industry in the form of taxes etc. paid on imported steel excluding government stores, amounted to Rs. 10·3 crores during the period 1924-25 to

1937-38 whereas the cost of protection to the Tata Steel Co., over the same period has come to only 8·89 crores.

A word is necessary about the price of Indian steel. It has been mentioned elsewhere in this article that price control on steel was introduced on the 1st July, 1944. Before that time Tata's prices were about Rs. 30/- per ton lower than the price fixed by the Government in the month of July 1944. Again in the month of March 1946 the steel industry has effected a reduction in the price of its principal products. We set out below a table showing the Tata's commercial prices on 30th June 1944, that is before the introduction of price control; the steel prices ruling on 1st July, 1944 as per Iron and Steel Controller's price circular; and the present prices ruling in the country.

—	All per ton f. o. r. Calcutta Bombay and Madras.					
	Tata's Commercial prices on 30-6-44 as per All-India P.L. No. 2 of 1-10-1943.		Sale prices ruling on 1-7-44 as per I S.C.'s Price Circular No. 1 of 1-7-44.		For sales by Registered Producers.	
	Tested.	Untested.	Tested.	Untested.	Untested.	Teste
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1. Bars (Rods & Sqrs. below 3" & flats up to and incl. 5" wide) ...	245/-	255/-	275/-	265/-	227/-	235/-
2. Bars other sizes	230/-	225/-	265/-	255/-	215/-	225/-
3. Structurals ...	230/-	225/-	265/-	255/-	215/-	225/-
4. Plates 3/8" & up	230/-	210/-	265/-	252/-	212/-	225/-
5. Plates ¼" un-annealed ...	...	233/-	285/8	273/-	233/-	215/8
6. Plates 1/8" un-annealed ...	260/-	243/-	287/8	275/-	235/-	247/8
7. Cheq. Plates ¼" & up ...	265/-	245/-	295/-	287/-	247/-	255/-
8. Boiler Plates 3/8" & up ...	250/-	...	285/-	...	...	245/-
9. Black Sheets 11-14G ...	270/-	245/-	296/-	285/-	245/-	255/-
10. G. C. Sheets 24G 6/10 ft. ...	365/-	360/-	363/-	363/-	320/-	320/-

From the above table it will appear that pre-control prices of Indian steel were about Rs. 30/- per ton lower than when the control was introduced. To-day the Indian steel prices on an average are lower than the pre-control prices by Rs. 20/- per ton and by Rs. 50/- than the prices when the control was first introduced.

Further it will be seen that the present Indian prices are lower than, not only the previous prices ruling in India, but also than the prices of British steel ruling in India. This fact would be attested by the figures given in the following table:—

Items.	Present Indian prices per ton.	Import prices per ton.	Percentage increase of Import prices over Indian prices.
1. Bars (below 3") ...	235/-	353/-	50%
2. Bars (other sizes)	225/-	324/-	44%
3. Structurals ...	225/-	309/-	37%
4. Plates $\frac{3}{8}''$ & up ...	225/-	320/-	42%
5. Cheq. plates ...	255/-	353/-	38%
6. Boiler Plates ...	245/-	333/-	39%

In the table given above we have taken the imported price as including duty on steel. It may, therefore, be argued that without the protective duty, the foreign steel might perhaps be cheaper. But this is not so as would be evidenced by the comparison we have made in the table given below:—

Articles.	Indian prices.	C.I.F. Prices of British Steel.	Percentage increase of British Prices over Indian Prices.
	Rs.	Rs.	%
1. Merchant Bars ...	235	312	33
2. Heavy Bars ...	225	287	28
3. Structurals ...	225	312	39
4. Plates $\frac{3}{8}''$ & above	225	283	26
5. Chequered Plates	255	313	23
6. Boiler Plates ...	245	295	20

Thus we find that even if British Steel was allowed to enter India duty free, its prices would be higher by 20 to 40 percent. After a long struggle extending over more than twenty years, the Steel Industry has now attained this position. It is a proof positive of the fact that Indian industries nurtured with due protection in their infancy have got the capability of doing without protection.

Conclusion.—From the foregoing survey of the Indian Iron and Steel industry it will be agreed that the industry has greatly expanded under the stress of war demands. Its total production has nearly doubled and special kinds of steel have been manufactured for the first time in the country.

Before the war, steel production in India depended on one very large producer. This unsatisfactory position has been removed by the establishment of a large steel plant by the Steel Corporation of Bengal with a production capacity which is only next to that of the Tata Iron and Steel Co. Also some of the re-rolling mills have set up electrical furnaces and have contributed greatly to the total production of steel in the country.

India may still have a long way to go before she could be completely self-sufficient but she is on the road to development and at the present pace of progress, will soon figure prominently among the steel producing nations of the world.

RE-ROLLING INDUSTRY (STEEL)

Introduction.—In the previous section on the basic Iron and Steel Industry we have pointed out that the Indian Steel Industry is composed of two branches, namely, the basic and the re-rolling. In this section we shall deal with the Steel Re-rolling Industry.

In India Re-rolling Industry is of recent growth. In 1919 the idea of starting the steel re-rolling industry was first mooted out by Sirdar Indra Singh. This idea, however, attained maturity in the year 1929 when Sardar Indra Singh established his first mill in Cawnpore. In the same year Lala Dinanath Khandelwal also opened a factory at Ghaziabad under the name and style of the Lakshmi Iron and Steel Co. Ltd.

Tariff Board (1933).—The year 1933 marks an important landmark in the history of the Re-rolling industry when the Tariff Board was appointed to re-examine the measure of protection then enjoyed by the Steel Industry. In 1927 when protection was originally granted to the Steel Industry the Re-rolling Industry had not come into existence and it was for the first time in 1933 that the conditions obtaining in the Re-rolling Industry were subjected to expert scrutiny and investigation. The position of the Industry at that time and its relationship with the only Main Producer of the times *i.e.* The Tata Iron & Steel Co. Ltd., are amply brought out in the observations of the Tariff Board, relevant extracts from which are given below:—

"With the exception of the Calcutta re-rolling mill of Messrs. Henry Williams, the Indian Wire and Steel Products Company's mill at Jamshedpur and the mill at Kumardhubi which is a re-rolling mill in close co-operation with the Tata Company, the industry is very new and inexperienced, and for the most part poorly equipped. At present, they re-roll scrap material only, being useful in consuming scrap iron from the railways, and manufacture merchant bars, and some plates and flats for the bazar and for agricultural implements. Their total output does not at present amount to more than a few thousand tons. So far as they use scrap only, they can have no permanent future. Their product is not of high quality, the quantity of scrap available is strictly limited and already the demand is

raising the price. They are able to compete in the market to day, because although their conversion costs are high, their overhead charges are low. It is reasonably certain that they must improve or be absorbed by the more efficient mills that will re-roll billets in addition to scrap. We may divide the re-rolling industry into two classes (*i*) the mills that roll ordinary sections only and (*ii*) those that rely mainly on special sections but will require to roll ordinary sections also in order to keep their mill in full working. The latter class to-day constitute the more important though less numerous section of the industry."

"The extension of the Tata Company's markets into remote parts has brought the company into sharp competition with these small works, and we have received numerous complaints against the methods employed by the company in pushing the sale of its own bars at the expense of these local rivals. We have no doubt that within their small compass these re-rolling mills have been able to make their competition felt; and in the effort to find new markets the Tata Company has followed the practice of big industry in other parts of the world and has reduced prices below the true commercial level. We have hinted that this is one of the causes of the excessive cost of the Company's sales policy. Some other practices against which complaint has been made were confined to isolated instances and the Company informs us that they will not be adopted again. We believe that, as in England and elsewhere there is a place for these re-rolling mills in a well organised industry, and that the growth of a re-rolling section of the industry capable of dealing with small orders, even of steel products which may compete with the output of the main steel producing works, will be a natural and desirable outcome of the present tendency."

"Now the Company has laid stress on its desire to encourage nascent subsidiary industries, and obviously realizes the importance of developing new outlets for Indian steel. We therefore all the more deprecate the attitude which it has in the past been inclined to take towards these minor children of the industry. They have been enabled to take root under the shelter of protection, and we do not accept the argument that because they may be compelled, in the absence of an adequate supply of raw material from the major industry, to import part of their

raw material as a temporary measure, they are therefore not entitled to claim any consideration as an Indian industry. Nor can we accept as reasonable the demand of the Company that if they are supplied with billets the minor industry should be precluded from rolling sections which will compete with the products of the basic industry. As we have said, we believe that there is scope for the smaller mills in supplying part of the balance of demand and that they can play their part in overcoming what is certainly the gravest handicap to-day of the Indian industry, the difficulty of distribution."

"The Company has claimed protection of semi-finished products in order to prevent the competition of these re-rolling mills, using foreign steel, on the ground that this competition will reduce the output of the basic industry. We see no valid ground for this fear, but on the contrary consider that the Company as the sole representative of a protected parent industry has underestimated its responsibility to the smaller industry in the matter of the supply of raw material. There may remain within the area of the local markets a conflict of interests between the basic and this minor industry, particularly when demand is so low as at present; but we see no reason why if the English industry has been able to come to an agreement for the regular supply of raw material to the re-rolling mills, a similar arrangement should, without any sacrifice of the shareholders' interests, be impossible in India—arrangement which would incidentally provide an increasing outlet for the Company's production of steel. We recognise, however, that there will be great difficulties in present circumstances, and with the minor industry so unorganised, in the way of individual agreements, and our proposal for the free entry of billets (paragraph 114) is intended to ensure a cheap supply to the minor industry in the event of the basic Indian industry being unable or un-willing to supply its requirements."

War Period.—Being prompted by the observations of the Tariff Board several mills were started in the country some of which had to encounter disaster on account of the in-efficient plants they had started with and for lack of technical supervision and finance. For some time before the declaration of war, on account of the shortage of steel created by the armament

policies of the European countries, the prospects of the Re-rolling industry had changed for the better and with the declaration of war started a new chapter in the history of the Re-rolling industry. With a view to securing maximum utilisation of the productive capacities with the available resources of raw materials the existing mills formed themselves into an Association at the instance of the Government under the Chairmanship of the Advisor on steel supplies to the Government of India, Mr. J. C. Mahindra who was also the Sales Manager of Messrs. Tata Iron & Steel Co. Ltd.

The large demand created by the war and the consequent increase in prices led to a mushroom growth of re-rolling mills in the country. These new mills taxed the raw material resources to such an extent that in a Press Communique dated the 6th September, 1941 the Government of India declared that the available raw material was hardly sufficient to meet the requirements of mills that were already existing and gave a public warning that "in the event of the Government of India having to take special measures to regulate the supply of scrap to Re-rolling mills and other users, it will not include any re-rolling mills started on or after September, 1941 in suuh measures". The Government also announced on 14th October, 1942 that it will deal with one trade association only *i.e.* the Steel Re-Rolling Mills Association of India and invited all the mills who had started operation on or before the 1st September, 1941 to become members of this Association Naturally all the Re-Rolling Mills in the country became members of the said Association and as this Association had already the two Main Producers *i.e.* Tata Iron & Steel Co. Ltd and the Steel Corporation of Bengal Ltd. on its membership it became the most representative organisation of the Industry.

In consultation with the Association the Government then divided the Re-Rolling Mills in four categories, *viz*:—

A1—Highly efficient mills producing specialised products.

A—Less efficient.

B—Still less efficient.

C—Least efficient.

It was also agreed between the Association and the Government that subject to the availability of raw material Al Re-Rolling Mills would be supplied with raw materials to enable them to work to their full capacity, that A and B class Mills would be supplied with raw materials to enable them to work 2 and 1 shifts respectively, and that C class Mills would be supplied with raw materials as are left after allocation had been made to other Mills. Generally the C class Mills and some of the B class Mills were to work on re-rollable scrap acquired from the Railways and the Main Producers.

By the middle of 1944 the coal position in the country had seriously deteriorated and the Government were forced to adopt measures to eliminate wasteful consumption of coal. The Re-Rolling Industry and particularly its smaller units represented by all C class Mills and some of the B class Mills were especially hard hit by these measures. In its efforts to make the best utilisation of coal the Government served the above Mills with orders to close down their plants. The closure orders were continued upto the 30th June, 1945, after which date the Mills were again freed to start operations although no assistance by way of coal supplies was assured by the Government. This naturally added to the already heavy odds with which the smaller Mills had to contend and by way of relieving this burden the Government withdrew distribution control over these Mills and also increased the price of their products. Compensation to the Mills who were served with closure orders was also paid by the Government.

• Some of the bigger Re-Rolling Mills who were placed in category A have steel-making plants of their own and although these steel-making plants were not running very economically in the pre-war days, they stood the Mills in good stead when raw material supplies to the Mills became conspicuous by their shortage.

Present Position.—As already stated above, the re-rolling mills have been classified under A, B & C classes. Class A consists of about a dozen mills some of which have been established in pre-war days or in the earlier years of the war. They are equipped for manufacturing bars and flats etc. Eight of these have established electrical furnaces or Open

Hearth Steel Furnaces. They can be regarded as secondary steel producers. Some of these are National Iron and Steel Co. Ltd., Messrs. Bhartia Electrical Steel Co. Ltd., of Calcutta, Steel and General Mills Co. Ltd., Messrs. Mukund Iron & Steel Co. Ltd., of Lahore; Indian Hume Pipe Co., Ltd. and Messrs. Mukund Iron & Steel Works Ltd., of Bombay and Singh Engineering Works Ltd., and Messrs. J. K. Iron & Steel Co. Ltd., of Cawnpore. The following table will give the year of establishment and the capacity of the electric furnace of each of the companies referred to above.

Name of the Company.	Year of establishment.	Electric Furnace Capacity.
1. National Iron & Steel Co. ...	1934	11 tons (a 25 ton basic Open Hearth Furnace is nearing completion).
2. Bhartia Electric Steel Co., Ltd.	1922	10 tons.
3. Steel & General Mills Co., Ltd.	1937	5 tons.
4. Mukund Iron & Steel Works, Lahore.	1937	5 tons.
5. Indian Hume Pipe Co, Ltd.	1926	3 tons.
6. Muknd Iron & Steel Works, Bombay.	1937	5 tons.
7. Messrs. Singh Engineering Works Ltd.	1920	5 tons basic Open Hearth Furnace.
8. J. K. Iron & Steel Co., Ltd.	1935	5 tons.

The steel output from these furnaces has mostly been rolled down into bars and flats but at the same time a fair sized steel foundry has been developed which is also taking steel from

electric furnaces. Some of these re-rolling factories also manufacture nuts, bolts, and rivets on a large scale and draw wire. "Steel Castings," which we shall describe in the next section, is also an important industry carried on by the re-rollers.

B and C class re-rollers form bulk of the re-rolling mills and number about ninety. They vary widely in their capacity. Their plants are also not well-equipped. More than 50 per cent of them were established after 1940, as a result of the increased demand created by the war for steel products. They use scrap as the raw material and their manufacture mostly consists of bars and flats. Many of the C class re-rolling mills have a capacity of less than 100 tons a month.

The most serious problem confronting the Re-Rolling Industry at the present time is acute shortage of raw material. During the war a large quantity of billets was imported from the U. S. A. under lease-lend arrangements and this had considerably eased raw material shortage. With the cessation of lease-lend supplies an acute shortage of billets is again being felt and the Industry is now feeling shortage of raw material to an extent not known before. The Ordnance Factories whose steel-making capacity is no longer required for war purposes are now engaged in producing billets for the Re-Rolling Mills, but compared to the demand their supplies are very insignificant. The Main Producers have, however, not been able to render much assistance in the matter of raw material supplies because of their own peculiar difficulties.

The stage has been reached when the Re-Rolling Mills collectively must either put up their own steel-making plants and be self-sufficient in the matter of raw material supplies or they must enter into some agreement with the Main Producers which may enable them to put up further steel-making capacity in their existing Works exclusively for the Re-Rollers. It is not known if any attempt at the latter solution which obviously is the better of the two has been made seriously by either party but it is understood that the general consensus of opinion amongst Re-Rollers is in favour of the idea of a third Steel Works in which the Re-Rollers themselves may have a controlling interest.

Future Outlook.—The fact that the steel re-rolling industry has a definite future in the industrial economy of the country is undisputed. All these have their uses in the esonomy of the country.

As regards A class re-rollers their chief concern will be, apart from protection to their individual products, the price the main steel industry will charge to them for billets etc. If Government has to intervene to fix the price of billets etc., it will also have to control the price of the products of these re-rollers which may not suit the latter. The main steel industry is fully aware of the strength of the A class re-rollers and in its own enlightened self-interest is not likely to drive a very hard bargain in fixing its price of billets etc. to this important class of re-rollers because it has to consider the prospect of these re-rollers grouping together to finance a small steel works of their own, if they are driven to it. In the circumstances, it seems best to leave the matter to the play of enlightened self-interest of the parties concerned.

Before the war, Government gave protection to them by exempting foreign billets etc., required by them from import duty and by not subjecting the re-rolling industry working on scrap or purchased billets to the excise duty which the main steel industry has to pay. These advantages to the industry should continue but something more has to be done to evolve order and rationalisation at least in the C class re-rollers who are apt to multiply inconveniently as the amount of money required to put up a locally made mill is very small but whose competition without having to provide for overhead and for the welfare of labour etc., has a disturbing effect on the sale prices of re-rolled material, as this C class re-rolling work is largely carried on as a sort of home or cottage industry; this difficulty will considerably increase with the adequate supply of scrap and coal. The obvious remedy is for Government to continue in some form its present control of re-rolling industries to allot raw materials including scrap, to schedule the production of each mill, to control the selling price and to prevent the increase in the number of such small re-rollers except under license. This is the main probleh so far as B & C class re-rollers are concerned. Some sort of Government control is required because

the number of C class re-rollers is large and they are not easily amenable to any planning discipline. With Government control, it would be possible to attempt some sort of rationalisation aiming at:

(1) Zonal distribution of the industry to eradicate unfair local competition.

(2) Standardisation of products to eliminate inefficient units.

(3) Control of production to avoid over-lapping and over production and to render scope for specialisation in different lines of production.

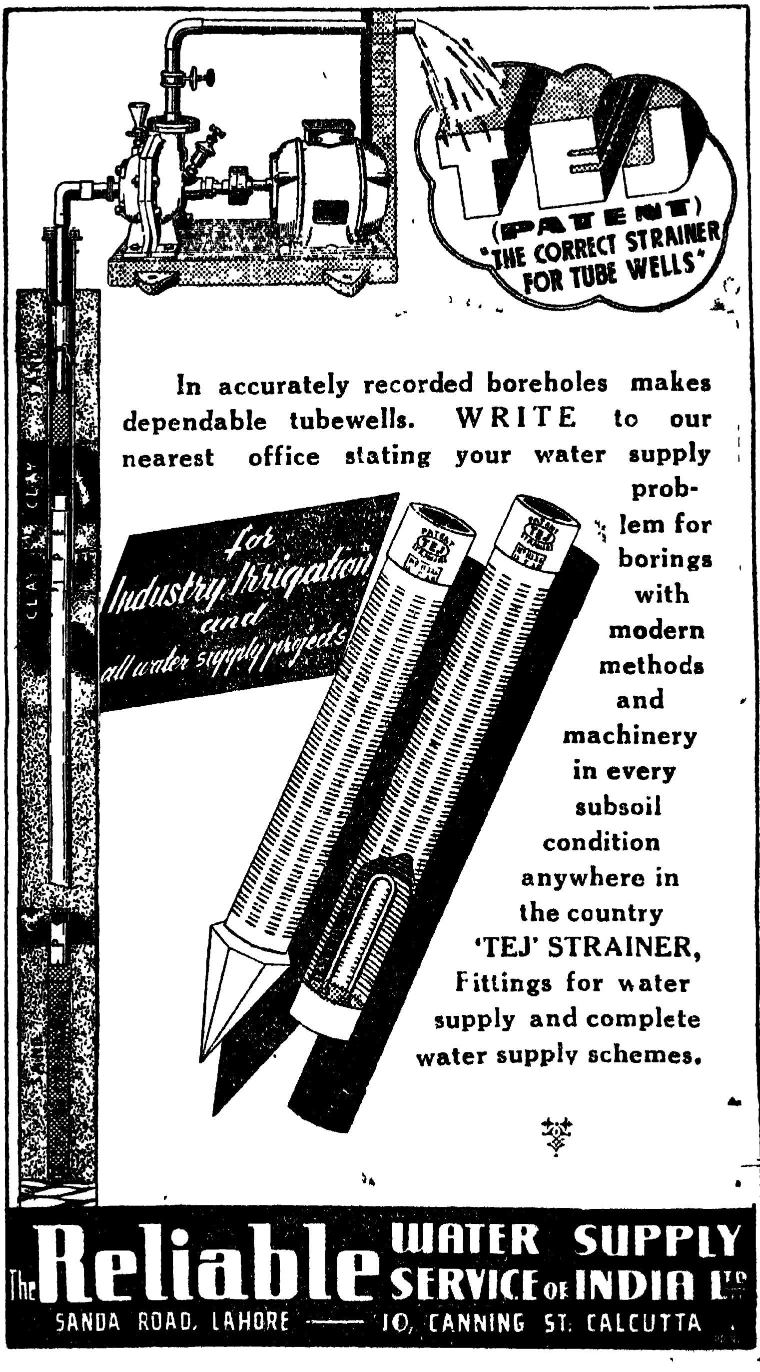
(4) Distribution of billets procured from the main steel industry.

Before the war, scrap was available for export to Japan etc. This has now to cease considering the maturity of the re-rolling industry and their growing requirements of re-rollable scrap. As some re-rolling mills have their own small furnaces to make steel and as the demand of melting scrap is increased for the main industry in Mysore and elsewhere, it would be advisable to stop the export of melting scrap also. This question will assume importance after the dumping of war scrap has subsided.

Conclusion.—It is a hopeful sign for the future that the Re-Rolling Industry is mindful of the necessity of reorganising itself on sound lines and as an attempt in this direction the Mills in the membership of the Steel Re-Rolling Mills Association of India were recently re-classified on considerations of efficiency of plant and management and adequacy of finance. As a salvaser of scrap and as a producer of special sections, this Industry has definitely a useful purpose to serve in the national economy and it is hoped that the Government will render all assistance necessary to enable this Industry to develop on proper lines.

As stated earlier the most serious handicap of this Industry to-day is shortage of raw material and Governmental assistance to relieve this is most urgently required by the Industry. It is understood that the import price of foreign billets is more

than the controlled price of billest in the country and this possibly stands in the way of Government securing adequate supplies of billets to the Re-Rolling Industry. If this Industry is to survive the famine, as it were of raw material, consideration of this nature should not weigh with the Government. Indian steel is the cheapest in the World to-day and if a small increase in the price is necessary to subsidise imports of billets, the country can well afford such an increase in return of increased supplies of steel which will naturally become available to the country for its rapid industrialisation and for the completion of so many other schemes of national advantage. It is also necessary that war time control of the Industry is continued to prevent any mush-room growth of mills in the country for which the present-day tendency of rising prices is only too favourable and to afford opportunity to the Industry to re-organise itself on sound lines.



Also at . . .

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SECTION II

ASSOCIATED INDUSTRIES

Associated Industries comprise the manufacture of tinplate, bolts, nuts and rivets, steel castings, wire and wire products, screws and expanded metal etc. These are all essential materials for the industrial economy of the country. Before the war India's requirements of 23,000 tons of bolts, nuts and rivets were largely met from imports. When war took a serious turn, imports fell away. At the same time war had created a great demand for nuts and bolts and other types of fasteners.

Tinplate is an important industry associated with the Steel Industry. This industry, started some 25 years ago, has now definitely been established and is in a position not only to meet India's demand fully but spare some tonnage for export as well.

Wood Screw Industry is quite new to the country. Started only some six years ago, it has made a headway and can meet a portion of India's demand. The present steel shortage is hampering the progress of the industry, but we have no doubt in the ability of the industry to tide over a period of crisis.

Steel Castings is an old industry requiring specialised knowledge of the trade. How it started and developed to its present position is explained later.

The Expanded Metal Industry is another product of the war. The industry can fully meet India's demand for expanded metal and with certain adjustments and assistance from the the Government can successfully face any foreign competition.

1—TINPLATE INDUSTRY

Introduction.—The establishment of the Tinplate Industry in India dates back to the year 1920 when a private company was registered for the manufacture of tinplates in India. The project for the manufacture of tinplates originated during the war of 1914 when the oil companies found great difficulties in obtaining the supplies they required. Negotiations between Messrs. Tata Iron & Steel Co., Ltd., and the Burma Oil Co., started in 1917, resulted in the registration of a private company in 1920 with a share capital of 75 lakhs of rupees approximately, 2/3rd being held by the Oil Company and 1/3rd by the Steel Company. The machinery for the factory was imported from America, the hot mills being designed on the American pattern to give an output per pair of rolls equal to 3 or 4 times the output of a Welsh tin factory. The manufacture of tinplate at the Indian Tinplate Co., began early in 1923 when two out of the six mills were in operation, but all the six mills had been put in operation by January 1924. The company then employed between 80 to 90 covenanted men imported from Wales and in the beginning all the work on the first two mills was done by them. Later Indian labour got sufficiently trained to perform the less responsible and exacting duty in the mills.

Prospects of the Tinplate Industry in 1924.—The Indian Tariff Board dealing with the natural advantages and prospects of the Tinplate Industry says that the natural advantages which the company enjoys for the manufacture of tinplate are those which hold good in the Steel Industry generally. The tin has to be imported, but in this respect India is not worse off than the United Kingdom. The annual consumption of tinplate in India is about 50,000 tons.

The Tinplate Co., made two important contracts, each of them for a period of 25 years. The first was with the Burma Oil Co., for the sale of the tinplate it produced. Under this contract the Oil Co., was entitled to take the whole output of the Tinplate Company if it was of satisfactory quality. The second contract was entered into with the Tata Iron & Steel Co., Ltd., for the purchase of the steel bars for making the tinplate. The Steel Company undertook to supply 35,000 tons of steel sheet bars under certain suitable price conditions.

From the above it would appear that the Tinplate Industry was assured of regular supply of sheet bars from the Steel Industry and of a regular market for its products by the Oil Company. These contracts helped the Tinplate Industry to a great extent.

Raw Materials.—The two important raw materials required for the Tinplate Industry are: Steel Sheet Bar and Block Tin. The tin bar itself is a finished product rolled into bar from the steel ingot to a definite analysis and specification. In 1927 the Indian Tinplate Co., entered into an agreement with Messrs. Tata Iron & Steel Co., Ltd., for the supply of 60,000 ton per year for 21 years at a fixed price which was Rs. 83/- per ton till December, 1936. Tin was obtained from some smelting companies in Singapore and Penang. In 1937 the Company consumed 900 tons of tin for its entire output. In addition to these raw materials some specialised items such as chilled rolls for the hot and cold rolling mills, annealing boxes, palm oil, zinc chloride etc., are needed for the manufacture of tinplate. Sulphuric acid is also required and is being manufactured by the Company itself in its own factory.

Technical Details and Process of Manufacture.—Tinplates are tinned sheets or mild steel sheets which are coated with tin of varying thickness. There are two kinds of tinplates, the coke finished and char-coal finished. The coke finished tinplates are of lower quality grades having a thin coating of tin and the charcoal finished plates are of higher quality grade with thicker coatings. The unit of measure of tinplate of light gauges is the 'base box' which is the area represented by 112 sheets of sizes 14″ × 20″ or 218 sq. ft. approximately. The heavier gauges sheets are sold by weight.

There are three processes in the manufacture of tinplates. The first process consists of rolling of the steel bar into sheets; the second process comprises the preparation of these sheets for tinning; and finally actual coating with tin is done. In the first stage the steel bar, ½″ thick, is reduced by the alternate heating, rolling and doubling to the required thinness of the finished tinplate. In this department, apart from climatic considerations, the work is arduous and requires experience and considerable skill. The sheets are then packed in packs of 8 sheets

about 60″ long and 30″ wide which are then sheared and separated by hand. After pickling in dilute sulphuric acid to remove scale and after annealing in a continuous furnace, in order to render them pliable, the sheets are rolled cold under high pressure to give them smooth surface for tinning purpose which is prefaced by a second pickling. The tinning machines are perfectly automatic in operation, the plates passing successively through zinc chloride (which acts as a flux) molten tin, and palm oil and are finally cleaned in a dusting machine as they pass into the warehouse where they are slit to size and sorted according to quality and packed.

Progress before the war.—The Indian Tinplate Industry made considerable progress during the period before the war of 1939. The production target for which the plant was originally designed was only 28,000 tons annually but by 1939 the figure had doubled itself supplying roughly over 90 per cent of India's demands for tinplates. The progress made by the industry will be evidenced from the following figures of production:

Year	Indian Production (tons)	Imports (tons)	Total Indian Consumption (tons)
1929-30 ...	35,681	31,087	66,768
1930-31 ...	37,868	17,229	55,097
1931-32 ...	38,306	7,584	45,890
1932-33 ...	38,967	7,003	45,970
1933-34 ...	45,270	7,240	52,510
1934-35 ...	49,934	5,583	55,517
1935-36 ...	51,839	6,488	58,327
1936-37 ...	52,643	1,352	53,995
1937-38 ...	53,431	7,441	60,872
1938-39 ...	46,761	14,013	60,774

Imports to India came from the United Kingdom, Japan, Germany, Italy and the U. S. A.

War-time development.—Tinplate is chiefly used for the manufacture of containers of tin for petrol, kerosene oil, other kinds of oil and for packing a number of articles like biscuits,

tea, fruits, ghee etc. It is also used for the manufacture of articles like lamps, cutlery, toys etc. During the war, movement of petrol, water, oil and grease etc., increased for the mechanised army. Similarly, containers were required for packing foodstuffs for being despatched to operational areas and for making utensils for the army. Tinplate also became essential for ammunition purposes. These increased military demands led to a considerable expansion of the Tinplate Industry and its production rose by about 40 per cent. In the following table we give the production of tinplate in India during the war years from which it would appear that production expanded greatly:

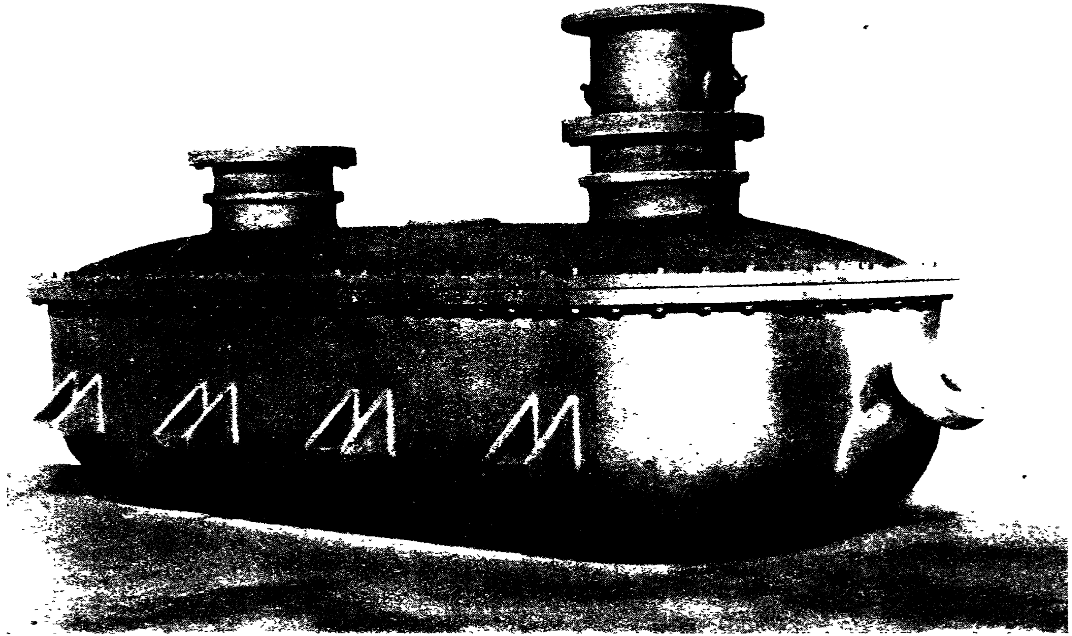
Years	Production (Tons)
1939	59,065
1940	61,787
1941	57,340
1942	58,335
1943	68,408
1944	73,512
1945	62,215
1946	58,250

Present position.—This increase in production by the Tinplate Industry has been possible because of the fact that the finishing capacity of the industry is greater than the rolling capacity and the industry, therefore, had been able to process and finish a large quantity of heavy gauge material supplied in the form of sheet packs by Tatas.

During the war the Company carried sufficient stocks of tin and was enabled to carry on its production in full swing in spite of stoppage of imports of tin from Malaya. The Tinplate Industry during the war developed a suitable indigenous substitute for palm oil. The Company is now in a position to manufacture any gauge but usually it produces from 20 to 34 BG. The only qualities of tin-plates which are not yet produced in India are special items known as "Taggers" which are very thin plates less than eight-thousandths of an inch

and tinned sheets which are hand dipped. The Company now makes some 250 different sizes and gauges of tinplates.

Future outlook.—With the expansion of a large number of industries in India like vegetable ghee, oil crushing and refining etc., etc., and the production of dehydrated and processed food, the demand for tinplate will continue. The major portion of the demand for tinplate has before the war come from the oil companies. Moreover, the Tinplate Industry can build up an expanding export market if India cannot absorb its entire production.



Anti Corrosive Castings Pan for the concentration of Sulphuric Acid made for an ordnance Factory in India, weight about 15 tons

Jamshedpur Engineering and Machine Manufacturing Co., Ltd.

2—STEEL CASTINGS

Origin.—The origin of the Steel Castings Industry dates back to 1922 when an Electric Furnace and a small steel foundry were put up at Ballygunge by Messrs. Sir Sarupchand Hukumchand & Co. under the name and style of Pioneer Electric Steel Co. This private firm was converted in a Public Limited Company in 1928 under the name of Hukumchand Electric Steel Co., Ltd. now known as Bhartia Electric Steel Company Ltd. There were two other contemporary steel foundries then in existence under the names of Kirtiyanand Iron & Steel Works Ltd., Rupnarainpur, E. I R. and Fairbrain Lowson Comb & Barbour (India) Ltd. near Asansol; but, possibly, both of them came to grief in later years as nothing is known of them at the present time.

Initial Period.—Unlike the usual way in which industries come into existence in times of comparative prosperity and shortage of supplies this industry started at a time when trade and industry were almost dull all over the world and supplies were abundant from foreign sources.

Writing to-day after 25 years of the existence of the industry we cannot explain the circumstances in which the industry was started except by reference to the enterprising spirit of the pioneers, Sir Sarupchand Hukumchand & Co., but for whose broad vision of things to come, the birth of the industry would have been considerably delayed.

As could very well have been expected then, the industry had to face heavy odds even in its infancy. Besides the general disinclination of buyers, mostly company-managed Railways suppervised by Europeans who had natural leanings in favour of the European Manufacturers, to change suppliers and to experiment with Indian Castings which nāme itself carried with it in the early thirties a sense of inferior product, the industry had to contend with imports from the industrially advanced countries of the West which were undoubtedly far better equipped both mechanically and technically. The Continental Manufacturers were the worse opponents as they would sell even below the British prices, let alone the Indian prices. There is

ample evidence on record to prove that the Continental Manufacturers were all out to nip this Indian Industry in the bud by dumping their products; but, fortunately for India, it proved too hard a nut to crack so easily. The consequence of this competition, however, was that the Indian Industry had to live on, as it were, the refuge of the trade—odd bits of castings required urgently for repairs and maintenance—but it struggled on and kept going. Another difficulty was the training of labour, particularly moulding labour as the technique employed in steel castings was entirely unknown to the country and the Pioneers had to take great pains in educating the labour. This was another handicap which very adversely affected the capacity of the Industry to compete.

Tariff Board Enquiry 1926-27.—For the first time in 1927, the conditions obtaining in the industry were subjected to expert scrutiny by the then Tariff Board presided over by no less a person than Dr. John Mathai, the Member for Railways in the Interim Government, which had been appointed to investigate into the claim for protection by the various sections of the Iron & Steel Industry, including the Steel Castings Industry. The economic position of the Industry was summed up by the Tariff Board in the following words, "The Industry at present works in a circle; prices are fixed on the basis of present costs and costs cannot be reduced because prices are too high to secure orders sufficient to ensure an economic output". The Tariff Board were also satisfied that the main obstacle in the way of growth was dumping by Continental Manufacturers and, therefore, observed that "the Indian Industry will not be adequately safeguarded unless the scale of protection is based on the import prices of Continental Castings". The Industry was able to establish its case before the Board and the Board recommended a small measure of protection by way of a bounty.

Post Tariff Board Report Period.—The vicious circle referred to by the Board was, however, broken to a certain extent by the Board's own recommendation for grant of some protection to the Wagon Building Industry which was the second best consumer of steel castings, the first being the Railways themselves which ordered the wagons. With increased wagon production and the consequent increase in steel castings demand,

the Industry saw the beginning of good days. Progress from those days onwards has been slow but steady and a number of new foundries were set up, the chief among which was the one set up by Messrs. Burn & Co., Howrah, who had the additional advantage of owning a Wagon Building Shop as well. The demand for steel, including the steel castings, created by the armament policies of the European countries in the latter part of the forties gave a further stimulus to the Indian Industry by keeping away imports and it was by this time that the Industry became quite independent of foreign competition.

War Period.—During the war the Industry witnessed a period of comparative prosperity. On the declaration of the war in Europe, imports of castings from the Continent ceased completely and the Indian Industry was called upon to supply all the demand that arose inside the country. An additional demand for castings was also created by the war time purchases of the Government purely for the purposes of defence requirements. The tables were now completely turned and whereas the Industry resented at the import of foreign castings in the pre-war days, it became apparent during the course of the war that it would considerably ease the situation if castings from abroad could be obtained. In common with a number of other Indian Industries the Steel Castings Industry was also subjected to Government control when it became evident that some measure of priority rating was absolutely indispensible to secure the most desirable sequence of deliveries. The Government, however, were alive to the disadvantage of a purely arbitrary form of control and agreed that the ideal arrangement would be for the Industry to constitute a fully representative and active Panel which could be called upon to give constant and effective assistance in planning, with a view to ensuring an optimum utilisation of capacity with the minimum of dislocation. Accordingly a Steel Castings Panel was constituted with representatives from the four important Steel Castings Producers, namely, Messrs. Bhartia Electric Steel Co., Ltd., Kumardhubi Engineering Works Ltd., Burn & Co., Ltd. and National Iron & Steel Co., Ltd. who between themselves command more than 75% capacity of the entire Industry. Since the middle of 1943 when this Panel was constituted it has proved of immense assistance in maintaining satisfactory liason

between the Steel Foundries and the old D. G. M. P. This Panel also negotiated prices for steel castings to be supplied by its members.

This Panel is still in existence although a large number of other Panels similarly constituted for other Industries during the war have since been wound up.

Post-War Period.—Although it is about 2 years since the hostilities ceased there has been no appreciable diminution in the orders for steel castings on the Producers' books. The gap created by the cessation of orders for the defence services has been more than off-set by the increased industrial demand which was more or less starved during the war when steel castings were rationed. In the very nature of things, Industries of whatever description they may be must necessarily require steel castings for their maintenance and upkeep and the pent-up demand from this source is now making itself felt very strongly. Besides, the various Government schemes for the improvement of roads, expansion of railways, manufacture of locomotives and road rollers etc. promise to create a demand greater than what the Industry is capable of handling to-day. Some of these demands have started materialising and the Industry has been recently called upon to quote for more than 2000 tons of steel castings required for the Diesel and Steam Road Rollers.

The present potential capacity of the Industry is 13,500 tons of steel castings per annum distributed amongst the following Producers.

Bhartia Electric Steel Co., Ltd.	...	3,000 tons.
Kumardhubi Engineering Works Ltd.	...	3,000 ,,
Burn & Co., Ltd. ...	...	2,400 ,,
National Iron & Steel Co., Ltd.	...	1,200 ,,
Mukund Iron & Steel Co., Ltd., Lahore	...	600 ,,
Mukund Iron & Steel Co., Ltd., Bombay ...	...	300 ,,
Steel & General Metals Ltd.	...	900 ,,
Indian Hume Pipe Co., Ltd.	...	500 ,,
Mysore Iron & Steel Works	...	600 ,,
Singh Engineering Works Ltd.	...	500 ,,
J. K. Iron & Steel Co., Ltd.	...	500 ,,

The bigger of the Indian Foundries are laid out for mass production of railway castings such as, Axle Boxes, Buffer Plungers, Buffer Cases, Rubbing Blocks etc. They also undertake trade and industrial orders, but the greater part of their output is accounted for by railway castings. The smaller foundries are mostly busy now with trade enquiries but they are also making considerable efforts to expand and improve their production and it can be safely predicted that they have a bright future. The Industry to-day, however, suffers from a serious drawback for want of sufficient machining capacity. Although some of the foundries have a balanced plant the majority of them do not have adequate machining capacity and are forced to look to the Ordnance Factories and Railway Workshops for machining their castings. It, however, cannot be said that these foundries are not alive to this deficiency and it is understood that many of them have ordered new plant and machinery which will balance their plant.

It must, however, be said that the technique employed in the Indian foundries is obsolete when compared to that employed in the U. S. A., the U. K. and over the Continent. The Sand Conditioning Plant, the Sand Slinger Machine, the Stand Testing Machine and a variety of other equipment commonly used in the foreign foundries are still unknown to the Indian Founder. The sooner these methods are employed the better for the Industry, because, it is idle to expect the sellers' market conditions of to-day to continue for more than a couple of years. The Industry must equip itself without any further delay with the latest methods of production so that when time comes it will be able to withstand competition without begging for protection.

Those who have witnessed the working of foundries in the U. K. and over the Continent will testify to the fact that there is a colossal waste of labour in the Indian foundries. There are practically no labour saving mechanical devices employed in an average Indian foundry. The cheapness of Indian labour may have at one time off-set the economic advantages of mechanical handling, but this charactertistic of Indian labour has undergone a complete change during recent years and contemporaneous events—largescale strikes in industrial

establishments, new labour laws and the growth of trade-union movement—promise an increasing incidence of labour cost. Whether this change and particularly the galloping speed with which it has come, has been to the good or to the bad of the industrial revolution in the country is not the concern of this article, but the fact remains that this change of characteristics has taken place and will persist. The Industry has got to contend with it and the best way to counteract the effect of the increased cost of labour is to introduce labour saving devices and there is tremendous scope for the introduction of such devices in the Indian steel foundries in the form of Conveyer Systems, Automatic Moulding Machines, Sand Conveyers etc. and the foundries cannot afford to ignore these without seriously increasing their cost of production.

Future Outlook—Although the future prospects are by no means dull, the Industry needs re-equipment on the above lines and it is also necessary that attention is paid to the following aspects which are now completely neglected.

There is a great need for a Research Laboratory dedicated absolutely to the advancement of the Steel Castings Industry. There is no doubt now that this Industry will expand considerably in the near future and it is absolutely indispensible that the aid of science is brought to its assistance. With the industrial advancement of the country in general this Industry will be called upon to make specialised castings for which it is ill-equipped now without a Research Laboratory. In the matter of Sand Treatment also the establishment of a Research Laboratory brooks no delay. The sands used at present by the Industry in making Moulds require a lot of baking before the Sand-Mould is ready for pouring; but, this colossal waste of fuel in the process of baking can be avoided if a formula for mixing and bonding the sands available in the country could be devised which will make baking unnecessary. This, however, cannot be done without a Research Laboratory.

Secondly, a closer co-ordination between the various manufacturers through a common Association is also necessary for the development of the Industry on proper lines, and it is to be hoped that such an Association will be in existence before long.

3—WIRES AND WIRE NAILS INDUSTRY

Introduction.—India owes the Wire & Wire Nails Industry to the pioneering efforts and enterprise of the Indian Steel & Wire Products Ltd., which was formed in 1919 with a view to manufacturing all types of wire and wire products. Owing to great many initial difficulties the Company could not commence operation until about 1923. The Company was then managed by Messrs. Lalubhai Walchand Kapadia & Co., and contained many Bombay industrialists on its Board of Directors and was registered with an authorised capital of Rs. 50 lakhs.

Earlier Development.—In the early years of its existence, the Indian Wire & Wire Nail Industry was faced with a terrible competition from foreign countries. Therefore, when the Tariff Board for examining the case of Indian steel industry was appointed, the industry approached the Government of India for necessary protection. The Tariff Board which reported in 1924 found all the conditions laid down by the Fiscal Commission fulfilled by the industry and recommended a specific duty of Rs. 60 per ton on wire and wire nails and a specific duty of Rs. 50 on wire rods. Later, on account of the exigencies of the moment and with a view to off-setting the exchange advantages derived by the foreigners, the specific duty was increased to Rs. 90/-. But the foreign competition was so keen that the company could not take advantage of this increased protection. In view of the difficulties then existing the industry again applied for protection.

In 1928 Messrs. Indra Singh & Son bought over the concern and commenced operation in March, 1928 and invested fresh finances which amounted to over 63 lakhs of rupees in September, 1923. The Government of India in 1932 gave some relief to the industry by a grant of temporary assistance in the shape of a protective duty of Rs. 45 per ton on imported wire and wire nails. The new management studied every process minutely, firstly, with a view to effecting economies in the cost of production and secondly to perfecting the methods of production. They did their very best in further mechanising the factory, avoiding waste of energy, and perfecting the methods of production. They sent out their General

Manager to Europe and America who travelled extensively in Germany, France, Belgium, England and the U.S.A. for about a year and a half. They overhauled the organisation thoroughly. The production of the industry during the 5 years under the new management was as follows:—

Year	Wire	Wirenails
1928-29	1,898 tons	1,038 tons
1929-30	865 „	1,090 „
1930-31	1,819 „	1,554 „
1931-32	2,116 „	1,754 „
1932-33	4,952 „	3,678 „

The effect of grant of protection was evidenced in an all round progress in the industry. In addition to further investment and improvement, the industry, during the period of protection, added three new lines which had remarkable potentialities for the future. The manufacture of barbed wire, galvanised wire and staples were introduced after 1928.

1933 and afterwards.—In 1933 the position of the industry had more or less improved but the greatest difficulty experienced by the industry was the situation arising out of foreign competition. The position was fully explained to the Tariff Board who after careful scrutiny granted protection to the industry. In 1932 the company installed its own rod mills for the manufacture of wire rods. Since then the company has been manufacturing all its products from raw materials obtained from Messrs. Tata Iron & Steel Co., Ltd., in the form of billets.

The Tariff Board which reported in 1934 also upheld the claim of the industry for protection. The later events in the history of the industry are well-known and need not be repeated here.

Pre-War Position.—Thus, under the protection granted by the Government the Indian Wire and Wire Nail Industry

has made rapid progress. Until the outbreak of the war the company was engaged in producing the following items:—

(1) Rods below ½″ in diameter.

(2) Wire.

(*i*) H. B. Wire.

(*ii*) Annealed Wire.

(*iii*) Galvanised Wire.

(*iv*) Barbed Wire.

(3) Wire Nails.

(4) Bolts, Nuts & Rivets.

The annual production of all these articles consumed approximately 50,000 tons of billets.

War-time development.—After the outbreak of the war in 1939 the Indian Wire Industry gave increasing attention to the manufacture of articles for defence purposes which involved production of new kinds of wires. Some of the wires like telegraph wires and barbed wires were considered to be beyond the scope of the Indian industry but the Indian Wire Industry was successful in manufacturing telegraph wires to the required specifications and Government needs for this material were fully met. Similarly, production of barbed wire which did not come to much before the war increased sufficiently so as to supply nearly 600 tons a month of defence requirements. For this purpose the Indian Steel & Wire Products Ltd., extended their plant by adding 24 barbed machines during the period of the war. As a result of the expansion of manufacturing facilities in the barbed wire and galvanising departments, the Indian Steel & Wire Products installed new machinery for the drawing of wire.

Present position.—At the present time Indian production of wire and wire nails cover the following:—

Mild steel rounds and squares below ½″ in diameter to different specifications.

In addition to the usual quality of wires described above the following varieties of wires are also now being made in India:—

(1) Strand Wire.
(2) Spring Steel Wire.
(3) Bead Wires (for tyres).
(4) Signal Wires.
(5) High Tensile Wire.
(6) Barbed Wire.
(7) Telegraph and Telephone Wire.

The present production capacity of the Indian Steel & Wire Products Ltd., is as follows:—

Name of the article	Productive Capacity (In tons per year)
(1) Barbed Wire	60,000 tons
(2) H. B. & Annealed Wire ...	43,000 ,,
(3) Galvanised & Telegraph Wire ...	7,000 ,,
(4) Barbed Wire	6,000 ,,
(5) Wire Nails	4,500 ,,
(6) Bolts, Nuts & Rivets ...	1,000 ,,

Wire Nail Industry.—Although no attempt at the manufacture of wire by any other large-scale manufacturer could be successful, wire nail making has been carried on by some other small concerns in the country. In addition to the Indian Steel & Wire Products Ltd., Indian Hume Pipe Co., Ltd., manufacture wire for utilising them in the manufacture of Humepipes. Recently Messrs. Mukand Iron & Steel Works, Bombay, have set up a wire drawing plant for the manufacture of wire. In some areas nail making has been taken up on a small scale on the cottage industry basis. In 1943 the production of wire nails in India came to about 11,600 tons,

Conclusion.—In the matter of quality the products of the Indian Steel & Wire Products Ltd., are now on a par with the imports. It would appear that after imports begin to come in freely, the smaller concerns in the field would be faced with foreign competition. Extension and consolidation of the industry and the manufacture of new wire products require machinery and technical experts from abroad and Governmental assistance is necessary for this purpose. Whatever the present difficulties may be with the industry the Indian Wire & Wire Nail Industry has now a definite place in the industrial economy of the country.


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Mg. Director
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Amritsar.

4—SCREW INDUSTRY

Introduction.—The first successful establishment of Screw Industry in India dates back only to the early years of the World war, 1939 although an unsuccessful attempt seems to have been made much earlier near about 1932 in Karachi by a firm of the name of Messrs. Devidas Jethanand about whose existence and activities little is now known. So far as the recent interest in the industry is concerned, the pioneering efforts appear to have been made by the Universal Screw Factory of Chheharta (Amritsar) which was started in 1941. Within less than two years of its establishment other firms also entered the field and to-day the number of factories engaged in screw production is six all of which are the members of the Association. The capital invested by them already amounts to several lakhs of rupees.

The industry came into being directly as a result of scarce conditions of supply created by the war, the principal suppliers till the outbreak of the hostilities being the U. K., Germany, Sweden, and Belgium. Screws were needed in India by builders, architects, and makers of furniture, motor bodies, cabinets, buckets, trunks and electric fans etc. which accounted for about 2,500 tons of imported screws in the year just preceding the war. An abrupt breakdown of all import facilities together with the demands of various ordnance factories created favourable conditions for enterprising industrialists.

Localisation.—Strangely enough almost all the factories engaged in Screw production are located in the Punjab, for the essential raw material of wire is brought from the Indian Steel and Wire Products Ltd. situated in Tatanagar at a distance of 1159 miles. But the availability of labour easily-trained Punjabis having special aptitude for artisan skill—and proximity of extensive market in Northern India and cheap electricity commended itself to the industrialists. Thus the present location of the industry should be regarded as favourable except for the fact that at present the industry has to draw its raw material from a long distance. In the future scheme of things, a more regionalised dispersal of the industry will have to be aimed at because the Screw Industry has India-wide market and the present railway freight policy may not be quite helpful for marketing the products throughout the country.

Equipment.—Starting at a time when normal facilities of imports were altogether denied none of them except the Universal Screw Factory could obtain machinery from abroad. The Universal Screw Factory, coming into existence a little earlier had been able to get the first set of its machinery from Hongkong. This was utilised as a model for the fabrication of screw machinery locally in the workshop for further extensions. The results obtained bear eloquent testimony to the dexterity of Punjabi Engineers who, given requisite quality of raw materials, are capable of imitating any pattern howsoever complicated. Almost all of them have been working with machinery of their own fabrication yet their products have met with universal approbation and during the war were reserved to meet the demand of the military.

The machinery required for the Screw Industry consists primarily of Heading Machines, Slotting Machines and Screw Threading Machines. All these machines installed in the factories are perfectly automatic and are run by electricity.

Production.—The six factories engaged in the manufacture of wood screws produce over five hundred tons of wood screws per annum. This production should not however be regarded as the optimum capacity of the Indian Industry. With gradual availability of sufficient wire and Government assistance with regard to protection, the industry can expand to a large extent.

In addition to iron wood screws, brass wood screws are also being manufactured in India. But the requirement of India for brass screws comes hardly to 60 tons per annum and can easily be met from indigenous sources.

Machine screws have also been successfully manufactured by the Indian factories. The Machine Screw Industry, however, requires further improvement.

Raw materials.—Hard bright steel wire, Spring Steel wire, Die Steel in rods are the main raw materials required for the industry. Steel wire has been supplied to the factories by the Indian Steel & Wire Products Ld., from Tatanagar but the supply has been limited and the factories had never had the opportunity during the period of the war to work to their full

capacity. The quality of the wire hitherto supplied to them was not best suited to the manufacture of quality screws. With the Indian Steel & Wire Products Ltd. supplying the free cutting steel wire as envisaged by them the position is likely to be greatly improved in regard to the quality and finish of the products. In addition to the Indian Steel and Wire Products Ltd. very recently successful attempts have been made by Messrs. Mukand Iron & Steel Works Ld., of Bombay to manufacture wire for the Screw Industry. Mukandas have an electric furnace in their factory which enables them to manufacture their own rods. They have set up a wire drawing plant which for the present can supply 700 tons of wire annually. It should further be mentioned that Mukands have another factory at Lahore which is also equipped with electric furnace and it is understood that the manufacture of wire can be successfully undertaken by the Lahore factory as well. If that comes about the Screw Industry which is at present located in the Punjab will save immensely in railway freights and its locational disadvantage from the point of view of source of supply of raw material will have been removed.

Difficulties.—During the war they manufactured almost entirely to meet the demand of the military and could spare very little for civil consumption. Now control on the supply of screws has been withdrawn and there is an ever increasing demand for their products. With the vast building programme underway it is considered that the optimum output of these factories may even fall shor of India's requirements for screws. But the factories have plans for expansion and with additional installations of machinery hope to be able to meet the entire demand. The termination of hostilities brought both fears and hopes—hopes of expansion and prosperity and fear of total annihilation by foreign manufacturers. With increasing shipping facilities the Indian market was open to the dangers of being flooded with foreign manufactured screws.

In recognition of the contribution of the industry to the war effort and its importance to the national economy of the country, the question of stabilising the industry has engaged the attention of the Indian Government. Investigations were carried on by the Indian Tariff Board with a view to ascertaining the nature

and the extent of assistance and protection needed for the development of the industry. A joint representation on behalf of all the factories engaged in the production of screws of various types urged upon the Tariff Board the necessity of erecting a high Tariff wall against foreign imports. The Board, having considered the claim of the woodscrew industry held that the industry had qualified for the grant of protection in the transition period. The Government have accepted the recommendation of the Tariff Board and changed the existing revenue duty of 30 per cent on iron and steel wood screws into a protective duty at the same rate. Other recommendations of the Board with regard to the supply of steel wire and assistance to the industry in obtaining up-to-date and efficient machinery have also been accepted.

Conclusion.—With the grant of protection and possibility of guarantee of a fixed annual turnover to meet the demand of various civil and military departments the Indian Screw Industry bids fair to an era of increased prosperity and commendable success.

5—BOLTS, NUTS & RIVETS

Introduction.—The manufacture of bolts, nuts and rivets started in India some 50 years back but till the end of the Great War (1914) the production was small and concentrated in the hands of small businessmen. Attempts to manufacture bolts, nuts and rivets on a large scale may be said to have originated only recently with the establishment of Messrs. Guest Keen Williams Ltd., at Calcutta.

These are required for fastening structural and other engineering works. Their raw materials, namely, bars, rods and wires come from the main steel industry. It is a necessary ancillary industry to engineering industries as well.

Demand for bolts and nuts.—Before the war average imports of bolts, nuts and rivets amounted to roughly 23,700 tons including nails. At that time Messrs. Guest Keen Williams Ltd., of Calcutta were by far the largest producers in the country. The imports of bolts, nuts and rivets during the 5 years before the war of 1939 were as follows:—

Years.	Quantity (Tons)
1934-35	22,307
1935-36	28,522
1936-37	21,716
1937-38	25,829
1938-39	19,987

Development during the war: (1939).—When the war of 1939 broke out imports fell away as would be evidenced from the following figures of imports:—

Years	Quantity
1939-40	14,581
1940-41	9,886
1941-42	10,757
1942-43	3,222
1943-44	3,532
1944-45	3,948

But the demand for them considerably increased because they were required in structural work of the pre-fabrication and unit construction type. All the military buildings, aeroplane hangers, bridges etc., have to be fabricated and carried in parts to the various theatres of war to be adjusted according to requirements. During the war in the then existing conditions the need for fastenings increased considerably. In order, therefore, to keep pace with the increasing demand, production of bolts, nuts and rivets was augmented which during the three crucial years of the war was as follows:—

Years.	Production in India.
1942	13,000 tons.
1943	20,000 ,,
1944	30,000 ,,

The demand for these materials was estimated at about 50,000 tons of which India could supply about 30,000.

Present position.—Of all the producers of bolts, nuts and rivets in the country, Messrs. Guest Keen Williams Ltd., continue to be the largest producers, their annual production amounting to about 12,000 tons per annum. This company has greaty extended its workshop at Calcutta and has opened another workshop in Bombay.

Messrs. Indian Steel & Wire Products Ltd., of Tatanagar, The National Iron & Steel Co., Calcutta and Messrs. Kaycee & Co., Ltd., Lahore are other big manufacturers of bolts and nuts in the country.

Future outlook.—At the present moment the demand for bolts, nuts and rivets is not the same as it was during the war period but still the present normal demand is greater than that in the pre-war period. With the huge building programme and construction of bridges, the Bolts & Nuts Industry is assured of a continued demand. The industry has definitely been established and can successfully compete with foreign products.

6—EXPANDED METAL

Introduction.—Like many other industries Expanded Metal Industry in India also owes its inception and development to the world War II which devasting as it has been in its character has brought about a tremendous change in the industrial field of the country. The most noteworthy feature so far as this industry is concerned is the remarkable development it has made both qualitatively and quantitatively during the short period of 5 years of war. The industry was almost unknown in the country before 1939 when the war broke out. Imports from outside countries altogether ceased and the stocks available in the market were very limited. On the other hand on account of its wide applications in various forms of re-inforcements there was a great demand from the Government for Defence requirements. The scarcity of supplies thus created gave great impetus to indigenous enterprise and two factories (1) Messrs. Calcutta expanded Metal Manufacturing Co., Calcutta and (2) Indian Expanded Metals Ltd., Bombay which had come into being a little earlier started the production of Expanded Metal on a large scale. Their capacity to the full was utilised throughout the war to meet the war requirements.

The demand, however was so great and urgent that the existing two factories could not meet the demand fully and the Director General of Munitions Production had to consider ways and means to increase the production further. The Government themselves ordered for two American plants for the manufacture of expanded metal. The delivery of the plants was, however, unduly delayed and by the time they were received in India the war on the continent of Europe had taken a different turn with the demands showing a sagging tendency. The Government, therefore, did not feel any urge to set up these plants themselves and were inclined to let them be sold out to Indian Industrialists. Accordingly these plants were sold out to Messrs. Kaycee Industries Ltd., Lahore and The Hindustan Wire and Metal Products Ltd., Calcutta. Thus two more factories came into the field in 1945-46 and the industry was more firmly established.

Applications and demands.—The Expanded metals are largely used for fencing, screen partitions and are most suitable for enclosures, ventilators, window guards, strong rooms,

lockers, open work flooring and a variety of other purposes. Another and the most important use to which the expanded metals are put is for reinforcement and it is specially suitable for reinforcing concrete in roads, pavements, foundations, walls, floors, roofs, bridges, tanks, reservoirs, etc. It is also an ideal ground for plaster works and is very useful as a combined permanent centering and reinforcement for concrete floor, roof and such other works. In the post-war plans of India's all-round industrial development, concrete is bound to play an important part and there is no doubt that there will be much greater demand for expanded metals in the near future. There already exists a great demand for expanded metals from the various industries and this is bound to grow when adequate supplies are available. The expanded metal is adaptable to innumerable purposes and in western countries it is being constantly put to some new use.

India's Requirement of Expanded Metal before the war.—Before the war India was almost entirely dependent on imports for her requirements of expanded metal which came principally from the U. K., Germany and Belgium and in later years from Japan as well.

During the five years immediately preceeding the war the duty collections on imports of Expanded Metal which would give an idea of its demand were as follows:—

1935-36	Rs. 5,84,000
1936-37	,, 6,50,000
1937-38	,, 5,00,000
1938-39	,, 6,70,000
1939-40	,, 3,40,000

From these figures it would be seen that on an average the total demand of the country for Expanded Metal from overseas has been of an order of about 5½ lakhs of rupees. Reckoning at an average price of Rs. 200 to Rs. 300/- per ton about 2,000 tons of expanded metal were imported annually.

Present time production.—Of the four factories engaged in the production of Expanded Metal Kaycee Industries Ltd., Lahore and Hindustan Wire and Metal Products Calcutta as already started have started production only recently and are not yet working to their full capacity. The present total production of India is in the neighbourhood of 3,000 tons

a year of different sizes of mesh ranging from 6″ mesh to 1/6th″ mesh by one shift working. This is expected to be increased further to 4,000 tons in the near future. The country's present demand is not more than 3,000 tons, so that her entire requirement can be met indigenously.

Owing to various difficulties particularly with regard to the supply of sufficient quantities of steel which is the main raw material of the industry it has not been possible to work to the full capacity. With supply position getting easier, the production will be gradually increased. Recourse to double or treble shift can also be taken to step up production further if required.

Difficulties: (Market).—The industry being new to India it is suffering from the teething trouble like all other industries. Previously only the English firms had the monopoly of the trade but afterwards a few Indian firms managed to obtain direct imports and these between themselves form a group of dealers known in the market and their co-operation must necessarily be sought for any scheme of large scale sales-promotion. Although it is a handicap to new dealers, it is by no means a serious bottleneck and is gradually on the way to decline with the new ones getting into repute, building up better marketing organisation of their own.

Raw Materials.—Steel Sheets rightly squared which are principal raw materials for the industry and which have been obtainable with the Tatas only have not been regularly available owing to the all round steel shortage in the country. The situation is not likely to be changed materially very soon although its supply must be assured if an industry just in its infancy has to be established firmly. The quality of sheets has now improved.

Transport.—Some of the manufacturers have been experiencing difficulties in the matter of booking their consignments particularly where it has to be carried on more than one railway line. As it is, expanded metal is manufactured in standard size sheets of 8 to 12 ft. in length movement of which is restricted on meter gauge lines with the result that it becomes difficult for the manufacturers to send their goods to such markets as are traversed by meter gauge lines.

Imports.—Government has agreed to assist the industry by restricting the imports of expanded metal for sometime.

The industry in England is enabled to obtain raw material at a concessional rate with the result that if free imports are permitted the indigenous industry which has to struggle hard to procure material and transport with adverse reactions on cost of production will be exposed to the dangers of foreign competition which in its present stage it may not be able to face. Fortunately for the industry England is yet not in a position to export expanded metals on account of her own heavy requirements for implementing their many schemes of post war reconstruction.

Prices.—Shortage of raw material, inexact quality, transport difficulties, just when the industry is in its nascent stage, all have contributed towards increasing the cost of production.

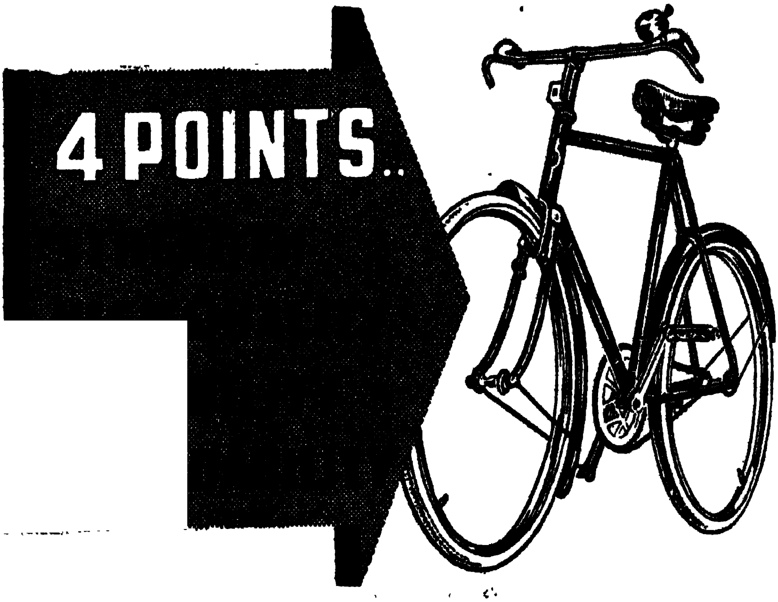
Before the war the price of imported material varied from -/1/- to -/8/- per sq. ft. When the supplies became scarce during war time the prices soared up and recorded a rise of about 500 per cent over the pre-war level. Although with strict control over profiteering the prices have again come down they are still selling at about double the pre-war prices.

To remove wide disparity between the prices ruling with different manufacturers they have recently agreed to fix the following prices as maximum.

S. W. M.	Strand Dimensions.	Price ex-factory per sq. ft. Rs. A. P.
3″	1/4″ × 1/8″	0 5 0
	1/8″ × 1/8″	0 3 3
1. 1/2″	1/8″ × 1/8″	0 5 6
	1/8″ × 1/16″	0 4 0
1″	1/8″ × 1/8″	0 7 9
	1/8″ × 1/16″	0 5 6
3/4″	1/8″ × 1/8″	0 10 0
	1/8″ × 1/16″	0 7 3
	3/32″ × 18G	0 6 0
	3/32″ × 20G	0 5 9
1/2″	1/8″ × 1/8″	0 10 9
	3/32″ × 1/16″	0 10 0
	3/32″ × 18G	0 9 0
	3/32″ × 20G	0 8 9

Apart from giving facility to the consumers this tentative arrangement will strengthen the Government in keeping its doors closed against foreign imports.

Conclusion.—Looking at the stage of development attained by the industry during the period of war through mutual help and co-operation with the Government and its ability now to meet in full the demand of the country and to further step up production if required, it can easily be said without any prejudice that the Expanded Metal industry is now firmly established in India. If the co-operation of the Government and the Railway is continued in the matter of purchase for their requirements for some time to come till further reduction in the cost of production is effected, a time will have come when the industry would no longer be in need of any assistance from the Government to face foreign competition here but will successfully be able to compete with them in foreign markets as well.



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SECTION III

NON-FERROUS METAL INDUSTRY

The gift bestowed upon India, of abundant natural resources which enables her to be a potential industrial country is our heritage. But it is deplorable that India has yet to depend on foreign countries for her non-ferrous metals and alloys requirements. Her inability to take the due place amongst other advanced industrial nations is inextricably linked up with the policy of the imperialist economic administration. India's knowledge of common non-ferrous metals and alloys dates back to the dawn of civilization. She had a glorious past in processing exquisite articles made of metals, the technique and beauty of which still remain unsurpassed. Alloying of brass and bellmetals, and manufacture of utensils and articles of art by processes of hammering and casting had been and are still being carried on with great technique and precision. In the absence of scientific means of technical control the artisans developed ingenious methods by which they could determine the correct temperature of molten metals and also the hardness of metals. During the period of Moghul Dynasty Copper was extracted and attempts were made to produce munitions, remnants of which may perhaps still be found. This is the background of our past as far as manufacture of non-ferrous metals is concerned.

The relative position of India with regard to supply of industrial minerals has been given by Mr. D. N. Wadia, the mineral adviser to the Government of India as follows:—

"1. Minerals of which our exportable supplies can dominate the world market:—

Iron Ore, Titanium ore, Mica.

2. Minerals of which our exportable surplus forms an important factor:—

Manganese ore
Bauxite
Magnesite
Refractory minerals
Natural abrasives
Steatite

Silica
Gypsum
Monumental granites
Monazite
Beryllium
Corrundum

3. Minerals in which India may be considered self-sufficient for present needs and those of the immediate future:—

Coal	Glass sand
Cement materials	Pyrite
Aluminium ore	Borax
Gold	Felspars
Copper ore	Nitrates
Chrome ore	Phosphates
Building stones	Zircon
Marble	Arsenic
Slate	Antimony
Industrial clays	Barytes
Limestone and Dolomite	Precious and semi-precious stones
Mineral Pigments	Vanadium
Sodium Salt and Alkalies	Rare earths
Alum	

4. Minerals for which India has to depend largely or entirely on foreign imports:—

Silver	Tungesten
Nickel	Molybdenum
Petroleum	Platinum
Sulphur	Graphite
Lead	Potash
Zinc	Asphalt
Tin	Fluorides".
Mercury	

The progress of India's mineral and metal industries during the last 50 years has been slow on account of lack of bold policy on the part of the Government, absence of basic industries and technical skill, absence of facilities for prospecting, mining and utilisation of minerals.

The non-ferrous metals industries as they are at present carried on in India can be grouped as follows:—

(1) Production of virgin metals from Indian ore deposits. This is primary production.

(2) Reclamation of metals and alloys from scrap. That is secondary production,

(3) Processing of metals into semi-manufactures; and

(4) Fabricating and casting industries which make finished products out of sheets, rods, wires etc.

(1) Production of virgin metals.—At present India produces, aluminium, copper, antimony and lead in the following quantities:—

Name of metal	Annual production (Long tons)	Percentage of present production to consumption
Aluminium ...	800 (from Indian Bauxite) 1,600 (from Imported Alumina)	30 to 40%
Copper ...	6,000	15 to 20%
Antimony ...	250	75%
Lead ...	100	Less than 1%

From the above table it would be seen that the present production of primary metals is not large. Before the war only copper was produced. Aluminium, Antimony and Lead production were started during the war.

(2) Reclamation of Metals and alloys from scrap.—This industry also developed during the war and now there are several firms engaged in this industry.

(3) Processing of metals and alloys.—The semi-manufacturing industry has been developed to a large extent as a result of scarce conditions of supply owing to stoppage of imports during the war. Most of the leading semi-manufacturing establishments have plans for installing modern plants and equipment which would greatly expand the present capacity of Indian semi-manufacturing industries.

(4) Fabricating and Casting Industry.—The manufacture of aluminium and brass utensils, aluminium stationery and table ware are carried on a large scale and there is a large number of small foundries which cast non-ferrous metals.

The foregoing survey will indicate that when the war broke out rather serious was the position that faced the Government with regard to non-ferrous metals. Stringent controls over the use of non-ferrous metals were introduced. The United Nations set up the Combined Raw Materials Board which carried out a careful survey in regard to the statistical position of each of the important raw materials. India supplies during the war were obtained through the Non-ferrous Metals Control established in the United Kingdom. The increased war demand for non-ferrous metals and their manufactures led to the development of virgin metal industry in the country and this had remarkable influence on the mining of ore and the refining of scrap. Great stimulus was also given to the production of various alloys and processing of metals and alloys for electrical, automobiles and ship-building industries. These developments are surveyed in the pages that follow.

1—ALMINIUM INDUSTRY

Introduction.—Indian Aluminium Industry, before the war (*i.e.* manufacture of metal from ore) was non-existent in India. The idea of manufacturing Aluminium out of Indian Bauxite was put into practical shape, for the first time, by the Aluminium Corporation of India Ltd. which was floated as a public limited company in September 1937. It was decided to extract alumina by the Bayer's process and to reduce such alumina through electrolytic process with high amperage. On this basis, the necessary plant and machinery were ordered by the Company from the Continent. As hydro-electric power was not easily available, it was necessary to run the factory on power generated from coal and this led the promoters of the industry to establish the factory at the pit-head of a coal mine near Asansol. Unfortunately the machinery ordered could not reach the works due to the outbreak of the war in 1939. Consequently no progress could be made and the management was taken over by the famous Singhania House of Cawnpore. Vigorous efforts were made before the new management could obtain the necessary plant with the help of the Government. The Corporation started producing Aluminium from September 1942. The factory consists of 3 main parts (1) The Alumina plant. (2) the Smelter consisting of a cell house where anhydrous Alumina is reduced electrolytically in Sodeberg type furnaces to pure aluminium metal and (3) the Paste plant where petroleum coke is converted into paste for use in the Sodeberg anodes of the reduction furnaces.

In addition to the Aluminium Corporation of India, another firm, namely, the Indian Aluminium Company, an offshoot of the famous Aluminium Canadian Interest is using imported alumina and reducing it in Travancore state.

In 1937 British and Canadian experts carried out a survey of India's potentialities of Aluminium production which resulted into the establishment of Aluminium Production Company of India Ltd. which is now known as the Indian Aluminium Company Ltd. The plan of this Company was (1) to produce alumina from Indian bauxite at Ranchi (2) to convert alumina into aluminium ingots at Alwaye (Travancore State) because

of the accessibility of cheap hydro-electric power there and (3) into various shapes at Belur near Calcutta in order to be near the centre of market. The Belur Works of the Company came into operation in 1941 for using imported aluminium ingots and scrap. The second part of their scheme materialised in March 1943 when the Indian Aluminium Company reduced imported aluminia to aluminium ingots at their works at Alwaye. The Company, since its start nine years ago, has continued prospecting and development work on its bauxite properties near Lohardaga in the Bihar province and also carried out a certain amount of prospecting work on deposits in other areas. This Company has acquired additional mining lease in 1945. The Company aims at making sure of a sufficient supply of bauxite for the operation of its works, and of any reasonable future expansion, for a period of fifty years.

The Indian Aluminium Company's Alumina Works at Muri Junction in Bihar are still under construction and all the major items of imported equipment have already been received.

Location of the Industry.—The factory of the Aluminium Corporation of India which alone produced alumina from Indian bauxite is situated 7 miles east of Asansol and at a distance of about 25 miles from Calcutta. The raw materials for the manufacture of aluminium are (1) Bauxite (2) Cryolite, and (3) Caustic Soda. Bauxite from which aluminium is produced is found in many parts of India. Bauxite occurs in Belgaum and Kolhapur, Thana and Khaira in Bombay; Ranchi plateau in Bihar; Jubbulpore and Balaghat districts of C. P.; Shevaroy hills in Salem and in Kashmir. The majority of Indian bauxite deposits are easily workable though transport is a problem. In composition, the Indian bauxite deposits are of a high grade and suitable for modern methods of purification and reduction. The reserves of high grade bauxite in India is roughly estimated at 250 million tons. For the economic production of aluminium, bauxite must have a minimum alumina content of 52% and a maximum silica content of 5% and, fortunately, the Indian deposits satisfy these conditions. In fact some of the Indian bauxite deposits contain as much as 62% of aluminium oxide. The Aluminium Corporation of India draw their bauxite from their own mines at Ranchi about

200 miles from Asansol. Cryolite has got to be imported but the quantity required is small compared with the tonnage of aluminium processed. Caustic soda is available locally. Close by are the collieries and the power station which supply electric power and steam for use in the factory and the collieries.

Similarly the Indian Aluminium Company, as already described, has got its mining properties near Lohardaga in the province of Bihar which is very near to its proposed works which are under construction at Muri junction. In addition the Company owns some property near Belgaum in the Bombay Presidency. The coal deposits in this case also are near at hand. In order to get the advantage of cheap electric power which is the most important factor of production in aluminium in countries like Canada, the Company has established its reduction works at Alwaye. It would be seen that the transport charges of alumina when produced at Muri and transported to Alwaye would be offset by the availability of cheap hydro-electric power.

Production.—The present productive capacity of Aluminium Industry in India may be taken at 3,500 tons per annum for each of the two factories. This will meet the entire demand of India for aluminium. The Aluminium Corporation of India are manufacturing the metal from alumina produced from Indian bauxite and turning them into bars, sheets and circles. They have also plans for the manufacture of a large range of consumer goods. All these three stages of production are carried on at their works near Asansol. In case of the Indian Aluminium Company Limited their alumina works have not so far started. Their reduction works at Alwaye treat imported alumina and have operated to the full capacity having regard to the availability of power. They manufacture ingots, sheets, and circles. The manufacture of aluminium ingot into sheets is carried on at their rolling mills at Belur near Calcutta where they possess a most up-to-date and complete rolling mill capable of producing aluminium sheets in all commercial forms and sizes. They have extended their works and installed equipment for the production of strong aluminium—alloy sheet which is extensively used for air-craft, transportation and other

industrial applications. The present production of sheets is estimated at 3,000 tons per year. Besides, India is producing foils, castings etc. Development of the industry in other directions, for example, tubes, rods and wires and cables is called for.

The Indian Aluminium Industry has been able to effect a smooth transition from war to peace time production without any appreciable drop in production or employment. The industry is fully technically equipped. The Indian Aluminium Company have got Indian technicians trained in Canada who have come back and are giving the industry the advantage of their training and experience.

Foreign Competition.—Before the war aluminium was imported into India in the following quantities.

Year	Total Tons.
1936/37	3162
1937/38	3342
1938/39	2893

But during the war and after, the demand for aluminium has gone up and the industry need not fear the prospect of over-production.

The greatest danger, however, to the Indian industry is the enormous increase in the production of aluminium during the war (1939) especially in Canada, Japan, America etc. To give an idea of the enormous increase, it may be stated that according to the Canadian Minister of Munitions, Mr. Howe, the production in Canada was as follows:—

1939	83,000 short tons.
1942	3,35,000 ,, ,,
1943	5,03,000 ,, ,,

making the Canadian capacity in 1943 equal to the total world production of aluminium in 1937. This flood of over-production will mean reduced world selling prices and Indian Companies will not find it easy to exist under such competition without

protective duties. But protective duties will be a sham and will only mean protection to foreign interests if the latter in the meanwhile capture Indian Companies under the stress of their financial difficulties owing to abnormally low world prices.

International Control of Aluminium.—Owing to the following reasons the aluminium industry has almost always been dominated by a small number of firms:

(1) for the electrolytic separation of the metal, a large investment is required,

(2) supplies of the economic raw materials are limited,

(3) the processes of production are complex, and

(4) the established interests have been against the rise of new units.

Before 1914 for instance the whole world production of aluminium was controlled by four Continental and one American Companies. In 1931 a strong cartel was established under the name of Alliance Aluminium Company of Basle. It rigidly limited production by fixing quotas. Its life was to be 99 years but it is understood it was abolished during the war period.

Protection to the Industry.—Prior to the war of 1939 the largest producers of aluminium in the world were Germany and Canada. In 1935, out of a total production of 250,000 tons Germany alone accounted for 72%. During the war on account of huge demand for war purposes, the production of aluminium has considerably increased. Among the countries producing aluminium, Canada tops the list and the Aluminium Company of Canada exerts a dominating influence over this industry. Therefore the Indian Industry will have to face a serious competition from foreign countries in the years to come. The industry, therefore, was promised Governmental assistance even during the war and immediately the Tariff Board was set up, the industry applied for protection.

The Tariff Board, after careful examination, recommended a scheme of protective duty-cum-subsidy to the industry for the period ending March, 1949. On the basis of a selling price to

the consumer of Rs. 1,600 per ton for ingots and Rs. 2,450 per ton for sheets and circles a specific duty of Rs. 590/- per ton on imports of ingots and sheets and circles has been recommended. The Board has estimated the fair selling price of ingots produced by the Indian Aluminium Co., Ltd., at Rs. 2,417 per ton in 1946-1947, Rs. 2,186 in 1947-1948 and Rs. 1.900/- in 1948-49; the fair selling price for the Aluminium Corporation of India Ltd., has been estimated at Rs. 2,448/- per ton in 1946-47, Rs. 2,176 in 1947-48 and Rs. 1,868 in 1948-49.

In order to cover the difference between the fair selling prices or costs of production and the selling prices to the consumer fixed by the Board, it is recommended that the Aluminium Company should be paid a subsidy of Rs. 817/- per ton during the six months October-March 1946-47, Rs. 586/- per ton in 1947-48 and Rs. 300/- in 1948-49. The Corporation should be paid a subsidy of Rs. 848/-, Rs. 576/- and Rs. 268/- per ton respectively during the three periods.

The Board has also recommended that production of aluminium should be encouraged, specifications should be prescribed to ensure the purity of the metal and rolling mills should be helped to procure modern and up-to-date equipment from abroad.

The Government of India have carefully considered the report of the Tariff Board and have come to the conclusion that aluminium is a "key" industry, which should be developed in India. They feel, however, that the Tariff Board's report raises various issues of great importance, and have, therefore, decided to appoint an official committee to carry out a further investigation of a technical nature.

Government have deferred passing orders on Board's report until the proposed investigation has been carried out. Pending completion of the Committee's enquiry, the existing pool arrangement for aluminium, by which imports and local production are pooled together and a common price fixed, modified to suit changed conditions, will be continued. The Industries and Supplies Department of the Government of India will extend the arrangement to cover aluminium sheets and circles as well.

Aluminium Fabricating Industry.—There are three important industries connected with Aluminium (1) The production of metal from bauxite (2) fabrication of the metal into bars, sheets, castings etc.; and (3) manufacture of consumer goods like utensils, containers etc. In the preceding paragraphs we have given details of the first two industries. Now a word may be said about the manufacture of consumer goods out of aluminium. In the field of this industry the first attempt appears to have been made by the Indian Aluminium Co., Ltd., in Madras in 1912 which came to grief in 1939. Of all the manufacturers of consumer goods out of aluminium, the firms of Messrs. Jeewanlal & Co. was by far the largest who established their first factory in 1918 in Calcutta and a factory in each of the important towns of India and in Rangoon and Aden.

After the war of 1914, competition from foreign countries into the Indian Market grew and Messrs. Jeewan Lal & Co. were merged with a Canadian Company which emerged as Jeewanlal (1929) Ltd. The Company purchased the Indian Aluminium Co. also which was liquidated in 1939 as stated above. In addition to Messrs. Jeewanlal (1929) Ltd., there are other important factories in the field and India to-day manufactures all sorts of aluminium goods. This industry is now definitely established and need not fear foreign competition.

Conclusion.—Aluminium Industry has a bright future in all its forms. Aluminium has come to great prominence especially during the war because it played a great part in the automobiles, aircraft, chemical and other industries. Although motor cars and aeroplanes have not yet begun to be manufactured in India, a good beginning has been made in the assembly of cars and repair and maintenance of aeroplanes. Under the existing conditions of India both these industries must get encouragement and the use of aluminium is bound to increase. Besides, owing to its lightness and comparative cheapness aluminium is required in many other industries like Electrical, Chemical and Metallurgical etc. For example, for the manufacture of blades of electric fans, containers for medicines, soaps etc. and for de-oxidising steel, manufacture of articles like window frames, stationery and table ware, increasing use is now made of aluminium. The war of 1939 has shown

the great importance of aluminium which was used in the manufacture of auxiliary parts of electrical transformers, field telephone parts, posts and telegraph requirements, sirens, air-crafts, scientific instruments, bodies of motor cars and furniture etc. The present demand for aluminium in India is very substantially in excess of pre-war imports while increasing industrialisation of the country is opening up new opportunities for the industry. Thus we would find that the Indian Aluminium Industry need have no fear of lack of market and with the prospect of protection in sight the future of the industry is definitely assured.

2—COPPER INDUSTRY

Introduction.—The earliest attempt at prospecting of copper mines was made in the district of Singhbhum by a European firm of the name of Cape Copper Company in the year 1908. But owing to economic reasons as well as excessive flooding of the mines, the project was abandoned in 1922. The first successful attempt was made by another European firm of the name of Indian Copper Corporation who took over the mines from the Cape Company. They got themselves fully equipped with technical and financial resources and produced the first refined copper in 1929.

Location of the Industry.—Copper pyrite (Chalcopyrite) is the principal ore from which copper is refined. These deposits are fairly widely obtained in India. They are found in Jaipur State; Kumaun and Kangra Valleys in the Himalayas; in the Mysore State; in the Singbhum and Baragunda near Parasnath Hills and in the Sikim State. At all these centres copper was smelted in the past from pyrite ores for the manufacture of principal alloys of copper like brass and bronze. The copper content of Indian ore is about 2·5 per cent. and from this point of view the Indian resources in this mineral may be considered as small so far as the present is concerned.

Production.—At present only one mining concern in the Singhbhum area namely the Indian Copper Corporation of India produces 6,000 tons of copper by treating about 350,000 tons of ore. This product, however, is inferior to the product of larger refineries of countries like Africa and the U. S. A., because Indian Copper Corporation produce fire-refined copper and have no electrolytic plant the absence of which makes them unable to exclude a small proportion of nickel which prevents the use of copper in the electrical and wire drawing industries.

COPPER AND COPPER ALLOY SEMI-MANUFACTURES

Brass and Copper Sheet and Strip.—The Indian Copper Corporation are the biggest producers of hot rolled brass sheets although there are several firms producing brass sheets. They produce annually about 8,000 tons of brass sheets upto 21 S. W. G. They are intending to put up a new cold mill

which would increase their production of brass sheets upto 12,000 tons per year. The annual production of yellow-metal sheets during the war amounted to about 10,000 tons. This means that, at present, Indian production of brass sheets is not sufficient to meet even her pre-war demand which came to about 30,000 tons. It will, therefore, be necessary to encourage one or more of the firms at present engaged in rolling brass sheets to import up-to-date rolling mills, melting furnaces, and auxilliary equipment for the production of sheets and strips upto 30 S. W. G.

During the war, a useful development took place in the production of tea-lead for the lining of tea chests. This line of production was, however, given up due to non-availability of lead and the technical equipment of this industry was geared on to the production of cold-rolled brass and copper sheets upto 30 S. W. G. With the availability of lead, this capacity might again be switched on to the production of tea-lead.

Brass and Copper rods, bars and shapes and tubes.—For the manufacture of brass and copper bars and rods there are several firms all over India who hot and cold roll rods and bars. During the war these firms have produced them in sizes ranging betwees ½″ and 3″ diameter. The quality, however, has not been upto the mark and it is necessary that an extrusion press of about 2,000 ton capacity to meet the demand for rods, bars, shapes and tubes of brass and copper be established.

Brass and Copper Wire.—Large quantities of wire are being made in India, but wire of small coils of about 7 lbs. in weight only has so far been produced whereas imported wire may be in coils of upto 100 lbs. in weight. Indian brass and copper wires come upto a reasonable standard though they lack perfection and accuracy of gauge and temper.

The demand for brass and copper wire in India is very great. They are used in zari manufacture, in making rivets, screw, and nails and also for packing, binding and many other purposes. The electrical industry consumes good quantity of electrolytic copper wire and cables. During the war, the production of cables and wires has increased considerably and

there is no doubt that the industry can meet the Indian requirements.

Market.—Before the war, in addition to her annual production, India used to import about 9,000 tons of copper both wrought and un-wrought excluding telephone and telegraph wires. Brass to the tune of 16,000 tons, on an average, was imported. On account of the development of electrical industries, past and present, it is expected that India's demand of copper for base alloys would be in the neighbourhood of 30,000 tons per year and that of electrolytic copper about 20,000 tons. It would thus be seen that India's production of 6,000 tons of fire-refined copper seems very insignificant. As against this production, world output of copper in 1938 was 20,31,000 metric tons. World's largest producers of copper are the U. S. A., South America, Canada, Northern Rodhesia and Belgium Congo. India, therefore, will have to increase her production of virgin copper for which immediate and thorough prospecting and exploratory work of the copper deposits should be taken in hand and possibilities of imports of copper ore from neighbouring countries like Burma for refining in India should be explored.

International Control.—After the war of 1914, world producing capacity increased with the development of new low cost producers while world consumption failed to keep pace even before 1929 and the demand came down substantially during the period of the depression. Then came an international cartel which managed to maintain the prices at an artificially high level. In 1926 the producers in the U. S. A. organised the Copper Exporters Inc., who admitted foreign firms as non-voting members. The object of this institution was to prevent manipulation, eliminate middlemen, and "stabilise prices." The stabilisation of prices was a hoax and this organisation took the prices upwards which at one time went up as high as 24 cents a pound. In 1935 the copper producers concluded an agreement providing for co-operative marketing and price policy among the non-American producers. These people were all low cost producers. They applied themselves to increase production rather than the prices. In early 1937 all restrictions on production were removed by the Cartel and it was announced

that restrictions would be re-imposed if the prices fell far below the then existing levels.

The history of international control of copper production and price policy offers an object lesson for India, a country which is embarking on so many developmental schemes and which would require increasing quantities of copper. If the pre-war history of copper control is to repeat itself, it is worthwhile to consider the establishment of a world's consumers' organisation which would protect the consumers interest.

Conclusion.—We have surveyed in the foregoing paragraphs the present position of virgin copper production and production of copper and copper alloy semi-manufacturers. The existing production capacity of virgin copper gives no indication of any expansion in the near future. Firms producing fire refined copper should be regarded as manufacturers of hot rolled brass sheets rather than of copper, as they have not the capacity to compete with imported copper in the open market but are able to compete successfully in the field of brass sheet behind the protective tariff on brass sheet imports. The average annual requirement of copper comes to about 50,000 tons against the present production of 6,000 tons. To meet the gap steps as indicated above will have to be taken. So far as fabricators are concerned they have already been protected by the removal of import duty on virgin copper and, it is anticipated Government would take necessary measures to protect them by imposing heavy import duties on all semi-manufactures that are produced locally.

3—LEAD INDUSTRY

Introduction.—Indian lead ores have been mined in the past at a number of places in considerable quantities but so far no large deposits have been located. Production of lead from Indian ore on a sizeable scale was undertaken towards the close of war of 1939 in Bihar. In addition to this, lead pipes, sheets and accumulated plates have been manufactured on a fairly large scale.

Location of the industry.—Lead ores which are metallurgically known "Galena" occur at many places in India. The known occurrences are those of Manbhum and Drug Districts of C. P.; Hazaribagh in Bihar; and Datia and Gwalior in Central India. A good proportion of these ores is argentiferrous, yielding a few ounces of silver for a ton of ore. The Bihar smelter is situated within easy access of the mines. In Jaipur state too some quantities of lead ore are mined.

Production: (1) *Virgin metal.*—The present production of the Bihar smelter is about 100 tons a year which is insignificant as compared to the demand which comes to about 8,000 tons of lead both wrought and unwrought. India, therefore, will have still to depend for her requirements on imports. To increase Indian production all the occurrences of lead ore will require thorough prospecting and inspection, before they can be discarded as uneconomic.

(2) *Lead sheets.*—India at present is producing lead sheets upto 3′ of width. Demand for sheets upto 8′ width are considerable and is likely to augment in the future because of the development which has taken place in the chemical industry.

It is, therefore, necessary that the manufacture of wider sheets is encouraged in order to meet the existing and potential demands. Lead-sheets are also used in tea industries and building construction. It is understood that in place of lead sheets the tea industry can usefully take to aluminium foil for tea chest lining which will minimise the necessity of importing lead to that extent.

(3) *Accumulator plates.*—They are required for secondary batteries and are produced at present at Calcutta, Bombay and

Bangalore and some other places. It is understood that the Indian productive capacity for accumulator plates can be increased to meet all the Indian requirements locally.

(4) *Lead pipes.*—Lead pipes are being manufactured in India by Messrs. D. Waldie & Co., Ltd., in sizes ranging from 3/8″ to 6″ internal diameter. The present productive capacity of the factory is about 500 tons which can be increased to 800 tons ultimately. Before the war the demands for lead pipes were met from imports which were as follows:

1936-37	...	...	...	500 tons.
1937-38	...	...	...	700 „
1938-39	...	...	...	550 „

Lead pipes are mostly used for household pipe fittings and for the construction of chemical plants. It is not expected that the present Indian capacity can meet the demand as demand for lead pipes has now considerably expanded.

International Control of lead.—It would be interesting and instructive to make a study of international control of lead. After the first war of 1914 there was no agreement between the lead producers of the world till 1931 when all the producers except the U. S. A. agreed to cut down production by 20% in order to keep up prices but the prices dropped sharply in 1932 when the Cartel came to grief as a result of combined effort of devaluation of sterling and the imposition of a tariff barrier by Britain on lead coming from non-empire countries. In 1935 the lead producers came to a new agreement which was very flexible as it did not try the quota system of production but had provided for increased output by giving notice.

Conclusion.—The war of 1939 has shown beyond doubt that a Lead Smelting Industry is an absolute necessity for the country. The present producer, namely, the Eastern Smelting Company is intending to install a modern blast furnace capable of producing about 1,000 tons of lead per month. Since considerable expenditure is involved in proving the ore reserves, it is necessary for the Government to undertake the proving of the mines themselves. Reduction in freight rates on ores and raw

materials, factilities for imports of plant and machinery are other directions in which Government help is necessary. If, however, the Indian reserves are not found satisfactory, Government should help in importing ores or concentrates from outside India. During the war, the demand for lead pipes increased considerably and it is anticipated that it might reach a peak figure of about 25,000 tons within the first five years. It is, therefore, extremely essential that the Indian lead Industry both in its primary and secondary forms should be considerably expanded.

4—ANTIMONY

Introduction.—The Antimony Industry was started in India by Messrs. Beed Bros. Ltd., who established their plant in Bengal just before the war of 1939, for the refining of antimony from imported ore, but on account of difficulties in getting antimony ore from Burma during the war they had to close down and their production was also very small. Nothing is at present known about the activities of this firm in the field of antimony refining. But the stoppage of imports of antimony from outside and increasing demand at home led some Bombay industrialists to refine antimony from indigenous ore which resulted in the floatation of the Star Metal Refinery in 1940. This firm established its factory at Vikroli in the suburbs of Bombay and obtained its ore from the Chitral State in the N. W. F. P. where the firm acquired exclusive mining rights. It was decided to treat this ore in Bombay. The firm was fortunate in procuring the services of a leading expert metallurgist who helped in designing and erecting the refinery and continues to be its consulting technical expert. Antimony for the first time began to be produced in India from indigenous ore.

Location of the Industry.—Antimony ore, known as stibhite in metallurgical parlance occurs at Shagor in Chitral State and at the Shinghee Glacier in Lahal in Kangra district of the Punjab. Both these sources are highly inaccessible requiring man-handled transport over high passes and long distances before reaching the rail-head at Pathankot or Peshawar. The Bombay refinery treats the Chitral ores which have to travel a distance of over 15 hundred miles.

The mines are 200 miles away from the railhead. The road linking the mines to the railhead passes through rugged hilly tracts and high mountain passes. There is a motorable road for most of the distance but about 40 miles of the road on both sides of the Lohari pass (11,000 ft. high) is still not made and ore has to be transported on mules or coolie heads. Besides, the pass is covered with snow during winter when transport is not possible at all. The mines are also at a great height and ore has to be brought down to the valley for transporting further. There is no power available on this side and the mining operations are done by hand. It will, therefore, be

seen that the industry is not very well situated so far as the availability of its raw materials is concerned. In the case of location of this industry availability of market and technical labour predominate. Some of the difficulties connected with the supply of raw material can be removed by:—

(1) A good thorough road-link between the mines and the rail-head.

(2) Developing hydro-electric power at the mines for working them mechanically.

(3) Providing aerial ropeways for the transport of ores, and

(4) Devising a scheme to concentrate the ores at the mines and bring only the concentrate to Bombay to minimise the transport cost.

Production.—The smelter at Bombay can produce about 300 tons of antimony per year which is about the total consumption in India. On account of the factors enumerated above with regard to the difficulties in the supply of raw material, the cost of production is high. But with the stabilisation of general prices the cost of production is likely to come down. On the refinery side the process is complete and there does not seem much room for effecting economies.

The management have already effected economy in the cost of production by getting up a special kind of furnace known as "shaft furnace".

Protection to Industry.—After the Tariff Board was appointed by the Government of India the industry applied for Tariff protection in order to be able to compete with foreign antimony.

The Board, having considered this claim, submitted a report to Government. Its recommendations were, however, based on the assumption that the industry would depend exclusively on the indigenous ore, and were later modified when it was found that imported ore was being used. The Board considers that the industry is established on sound business lines and enjoys natural advantages. It has recommended the

grant of protection to the industry its main revised recommendations being as follows:—

(*i*) A protective duty of Rs. 60 per cent. should be levied up to the end of March 1949;

(*ii*) The specific duty should be modified under section 4(i) of the Indian Tariff Act of 1934 in the light of any variation in the c.i.f. price of star antimony imported from anywhere above Rs. 90 or below Rs. 80 per cwt.;

(*iii*) There should be separate heads in the Tariff Schedule for antimony and antimony crude. The specific duty on antimony crude should be 70 per cent. of the duty leveid on antimony metal;

(*iv*) Government should pay a subsidy to the Refinery in respect of actual sales, equal to the difference between the sale price of Rs. 150 per cwt. and the actual cost of production in 1947 but not exceeding Rs. 13 per cwt. The payment of subsidy should be similarly determined at the end of 1948 in the light of actual cost of production in 1948;

(*v*) In consideration of the grant of subsidy the Refinery should give an undertaking that all antimony would be sold at a maximum price of Rs. 150 per cwt.

(*vi*) The Central Government in the Department of Industries and Supplies should give every assistance to the Mining Company to secure a generating plant for working the floatation plant at the mine head;

(*vii*) The Central Government in the Department of Labour should examine the feasibility of constructing a road 40 miles in length over the Dir Pass between Peshawar and Chitral, construction being justified if the road will also serve other purposes, then reducing the cost of antimony ore mined at Chitral;

(*viii*) A review should be undertaken in the course of the year 1947, and the question whether the Company should be asked to constitute itself into a public limited concern should be examined;

(*ix*) Government requirements of antimony should be met from the indigenous production, even if the price of imported material is lower than that of Indian production.

The Government of India have taken the following action on the recommendations of the Tariff Board :—

"The Government of India have carefully considered these recommendations. While they are unable to agree that the industry can be described as having natural advantages, in view of the fact that the ore is mined in a remote and inaccessible region and transport from the minehead in Chitral to the rail-head at Durgai forms the main item in the cost of production, they accept the view that the industry is deserving of protection as a key industry. Since antimony is an essential material for munitions production, as well as for such important industrial requirements as type metals and anti-friction bearing metals, the national importance of the industry is sufficient to outweigh the natural disadvantages under which it labours.

The Government find that since the time of the Tariff Board's report the position has changed in several material particulars. Apart from the fact, which caused the Board to revise its recommendations, that the industry has been using some quantity of imported ore, the cost of production at the Star Metal Refinery has fallen to Rs. 195 per cwt. while the landed cost, including duty, or imported antimony is reported to have risen to Rs. 162-8/- per cwt., In view of these developments, Government consider that it would clearly be unnecessary to subsidise the industry and it would be sufficient to grant protection by means of a protective *ad valorem* duty.

Government also observe that no reliable estimate of the volume of ore deposits in Chitral was available to the Tariff Board. If the ore resources should prove to be limited, it would be unwise to exploit them at the present time and the more prudent course would be to keep them as a strategic reserve for utilisation at a time of emergency. Government accordingly propose to arrange for an investigation into the extent of the ore deposits.

Meanwhile, Government have decided to convert the existing revenue duty on antimony of 30 per cent. *ad valorem* into a

protective *ad valorem* duty at the same rate. This will serve as an assurance to the industry that it is considered deserving of protection and will enable Government to accord a further degree of protection, by executive action, if and when considered desirable. The present high landed cost of imported antimony will also, in the opinion of Government, provide sufficient protection for the industry for the present.

Government accept recommendation (iii) except that the protective duty on crude antimony will be an *ad valorem* duty of 20 per cent. (approximately 70 per cent. of the duty on antimony). Recommendations (vi), (viii) (ix) are accepted and steps will be taken to give effect to them. If however the ore deposits should prove to be limited it will be necessary to reconsider recommendation (ix). Recommendation (vii) will be further examined in the appropriate department of Government.

The necessary legislation to give effect to these decisions will be undertaken as soon as possible.

Conclusion.—Antimony is an important unit of the nonferrous metals industry which is a key industry for any nation. The establishment of the industry during the war stood the Government in good stead and the necessity of its existence in prosperous condition in peace time cannot be over-emphasised. Antomony sulphite is used in vulcanising rubber, in match making and in the manufacture of amunitions. The pure metal is used on a large scale for the manufacture of alloys like copper—tin—antimony used for bearing metals, Brittania metal which is mainly tin and antimony and type metal which contains lead, tin and antimony. Antimonial lead is widely used in the production of Shrapnel bullets and another similar alloy is used in the manufacture of battery plates, toys, tables and syphon tops. The industry therefore deserves its existence and the help that Government would extend to it will be of beneficial results. From the development of antimony industry some other lines of manufacture like antimony oxide, golden sulphate of antimony and some antimonial salts could usefully follow and help the industry in further bringing down its cost.



SPECIFICATION :—

FRAME: 100 per cent Steel sizes, 18″, 20″, 22″ and 24″.

WHEELS: 28″ × 1½″ Nickle or Chromium plated. Rims, Rustless spokes 26″ × 1½″ on 18″ and 20″ Frames.

TYRES & TUBES: DUNLOP ROADSTER.

HANDLEBARS: Raised pattern of Finest quality Steel.

PEDALS: Rubber, ball bearing.

SADDLE: Leather.

5—TIN INDUSTRY

Introduction.—Tin Industry is an important branch of the non-ferrous metal industries because of its extensive uses. It is used in the manufacture of antifriction metal and solders. Owing to its good resistance to corrosion under many conditions, tin is mainly used in the form of coatings for steel and copper alloys. It has been estimated that about 40% of world's output of tin is used in making tin-plates. It is also needed for the tinning of vessels for domestic use and for the manufacture of tin foils. Tin also enters in the manufacture of condensers for the electrical industry.

International Control.—The Non-Ferrous Metal Panel of the Government of India points out that the world's Tin Producers' Association inaugurated, in 1930, a voluntary restriction scheme over production of tin but it did not succeed. In 1931, a restriction scheme sponsored by the Government under the administration of an International Tin Committee came into operation. It included the representatives of chief tin producing countries. Later on, all the tin producing countries except China were represented on the Committee. This International control of tin production has led to a rise in the price of tin.

India's Position.—No workable deposits of tin have so far been located in India and the country has had to depend upon imports mainly from Malaya and Burma. During the period of war, with the loss of supplies from Malaya and Burma the tin supply position became very acute and the Government had to enforce non-ferrous control order. Indian imports of tin, before the war, came to about 2,500 tons per year but now the demand for tin may be taken at 4,000 tons per year.

During the war an attempt was made to refine imported tin ore from Burma. Technically, smelting of the ore presents little difficulty and, therefore, if sufficient quantity of ore is available refining can easily be started.

Detinning of tin-plate scrap is an important industry in countries like the U. S. A., Japan and Germany and several firms took up detinning during the war but the cost of detinning

is high and, therefore, the industry does not show signs of progress unless Government help is provided.

Conclusion.—Tin being an important industry, it is necessary that the industry develops in the country and the Government Panel has offered the following suggestions for its development:

(1) Prospecting for tin ores in India.

(2) Importing tin ores or concentrates, either from China, Malaya or Africa and smelting them in India.

(3) Development of spraying and electro-tinning for making tin-plate in place of the existing hot dip process.

(4) Encouraging de-tinning and assisting the existing firms to enable them to compete with imported tin which should be duty free.

(5) Encouraging Electrolytic tin-refining of impure tin or tin-rich scrap collected in India or imported from abroad.

(6) Prohibiting export of tin-plate scrap and allowing duty free imports of same.

6—MISCELLANEOUS NON-FERROUS INDUSTRIES

Introduction.—Under the miscellaneous group fall such industries as Nickel, Magnesium, Manganese, Beryllium, Arsenic, Barium, Titanium, Chromium, Tungsten, etc. Nickel is used in steel as an alloying element and in non-ferrous alloys. Magnesium, being lighter than Aluminium, is used in Radio Industry in the form of wire and ribbon. It is also used in some non-ferrous alloys. Manganese alloys are extensively used in the manufacture of steel. Beryllium as pure metal is used as a coating to steel to prevent attack from Hydrogen at high temperatures. The most important commercial use is as an alloying metal with copper, nickel, cobalt and iron. Metallic arsenic does not have many commercial uses. The industrial use of Barium is for ignition equipment in Automobile Industry. In the Radio Industry it is used to clean up last traces of gas in vacuum tubes. Barium compounds are extensively used in ceramics and glass industries. Titanium is used as an alloying element with steel, copper and aluminium. Titanium mineral is used in pigment, dyeing and ceramic industries and in the manufacture of welding rods. Chromium is used for plating purposes for giving good appearance. Tungsten is used in electric lamp industry, small tool industry etc.

India's Production and Consumption.—The following table will indicate at a glance India's production of these metals and their total consumption:

Name of the Metal	India's Demand.	India's Production.
1	2	3
Nickel.	3,000 Tons per annum.	nil Some 2,000 tons per year of Nickel Silver is also imported into India.
Magnesium.	Exact tonnage is not known but Indian Consumption is very little.	About 43,000 tons of Magnesite was mined in India in 1939. The whole of it is exported.

Name of the metal.	India's Demand.	India's Production.
1	2	3
Manganese.	Exact tonnage is not known.	Only a small fragment of the quantity mined was uptil recently smelted for the production of ferro-manganese. Some 20,000 tons of ferro-manganese is being manufactured annually. Over 95% of Manganese is exported. India is one of the two principal producers of high grade Manganese in the world.
Beryllium.	Very little.	Rajputana produces excellent Beryl for export. Between 1932-35 it exported between 100 to 300 tons annually.
Arsenic.	About 200 tons.	Before the war Arsenic compounds were extracted in Chitral. Exact tonnage is not known, but there are enough deposits to start an industry to meet the Indian demand both as metal and as compound.
Barium.	Exact tonnage is not known but it is extensively used in the paint, ceramic and glass industries.	In 1941 the total Indian production of Barytes, the chief ore of Barium was 22,250 tons which was chiefly used in the Paint Industry.
Titanium.	Not exactly known.	The Bauxite deposits now worked for Aluminium Manufacture contain appreciable quantities of Titanium which can be recovered as a bye-product. No commercial production is at present undertaken.

Name of the metal.	India's Demand	India's Production.
1	2	3
Chromium.	About 15,000 tons.	During war years the production was about 50,000 tons but it can be developed further.
Tungsten.	The present consumption of tungsten is not much but with the future expansion of the steel industry it is likely to be considerable.	Production not undertaken at present. Wolfram which is the chief ore of tungsten is found in workable amounts in Rajputana and C. P. but no estimates of the reserves have so far been made.

Conclusion.—It would appear from the introductory paragraph that all these industries are important for the industrial development of the country. It is, therefore, necessary to start new industries and develop the existing ones.

7—NON-FERROUS REFINING INDUSTRIES

Refining of non-ferrous metals scrap is an important industry in every industrial Country of the world. When non-ferrous products are manufactured, large quantities of scrap arise and recovery of metals from these scraps becomes an organised industry. Before the war of 1939, major portion of Indian scrap was exported outside the country to the continent of Europe in the West and Japan in the East to come back to India in the form of refined metal.

From times immemorial the refining of yellow metal scrap has been carried on in this country. Even to-day large quantities of scrap are consumed in the manufacture of utensils. But now the time is ripe when scraps of all kinds should be segregated. At present there are several firms in India who refine scrap and produce gun-metal, and bearing metals etc. This industry stood the Government in good stead during the war and needs encouragement.

Recovering of metal from Commercial scrap is known as Secondary Metal Industry the problems of which we discuss in the next section.

SECONDARY METALS*

Collection, Segregation and Metallurgy.—The emblem of the Wasting Candle sketched by Thomas Carlyle about a century ago gives an excellent guide to a discussion of secondary metals problem of to-day. "*Terar Dum Prosim*" Carlyle wrote under the Candle "May I be wasted so that I be of use."

Secondary metal may be defined as metal recovered from commercial scrap, *i.e.*, is scrap that has entered the processor's plant in scrap form. Metal recovered by a manufacturer from scrap arising out of his manufacturing processes in his own plant which he can readily reconvert into finished product should not be considered as secondary metal. In contrast to virgin or primary metals, *i.e.*, metals extracted from ores, secondary metals are of secondary origin and result from the use of primary metals and alloys.

Secondary metals are most frequently referred to as scrap metals and according to their source can be divided into two important groups; first, the industrial scrap, resulting from the manufacture of wrought and cast metals and alloys and second, scrap arising from fabricated metal products which have outlived their usefulness. The secondary metal industry also performs two distinct functions; first, reworking of the secondary metal in order to bring it to its virgin or pure state so that it can perform all the functions to which primary metal derived from ores is put; and second, manufacturing standard alloys for which primary metals are generally used. In general then the secondary metal industry comprises of remelters, smelters, refiners and manufacturers that convert scrap metals and residues to produce refined metals, ingot alloys, fabricated shapes and chemical products.

Problems of Collecting and Grading Scrap Metals—Even in countries where well planned large-scale manufacturing processes are carried on, the collection and grading of scrap is a big head-ache. Metals and alloys which

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*** Appendix VI of the Report of the Industrial Panel on Non-Ferrous Metal Industries published by the Government of India, Planning & Development Department.**

usually look alike or are even identified by the same general name may contain large or small amount of other elements and it is absolutely necessary to keep the different kinds of scrap separated to make it easy for the scrap processors to know what they are buying or how they are going to process it. In India where large-scale manufacturing is conspicuous by its absence it is all the more necessary that the different plants give some extra thought to collection and segregation of scrap arising in their plants. However all the care taken to segregate scrap metals will be wasted if the so called 'junk' merchants who buy scrap from different sources, mix it up before selling it to processors. For this reason it is absolutely essential for the secondary metal industry to form an association of scrap dealers who can be initiated in the art and science of segregating and grading scrap. Technical advice can be given to this association by customers who buy the scrap for processing and the Chambers of Commerce or the Provincial Directors of Industries must advise the scrap producers to sell their scrap only to members of such a recognised association.

The first problem then is that of the producer of scrap. On how well he can reclaim and segregate his scrap depends the whole future of the secondary metal industry. Indian management has been lacking a great deal in the general cleanliness of their plants. Cleanliness is the first condition in the proper segregation of scrap. The dust and contamination from oil, etc. needs extra processing of the scrap and to that extent lowers the price it can fetch in the market. Each industry, each factory and each locality faces a different set of conditions. However, irrespective of the size of the plant certain fundamental principles can be applied for organisation and collection of scrap.

In the interest of clean scrap there should be appointed a foreman who along with his other duties understands the handling of scrap and should be given enough responsibility to devise his own ways and means of collecting scrap. Enough floor space should be provided in the factory for storing and proper accounting of all the scrap should be aimed at. Also the scrap should be segregated daily and a quick market should be found for the scrap so as to avoid storing large quantities. The

management should take an active interest in seeing that the scrap is kept segregated.

Though metallurgical processes are available for separating alloys into their constituent metals, there are economic limitations to the use of such processes. For instance it will be more economical to melt a selected quality of brass, refine the molten metal to some standard specification and cast it into ingots for further fabrication rather than melt any collection of brass to try to recover copper, zinc, etc., separately. This economy can only be realised if the scrap metal is separated into classes which resemble the original alloy composition as nearly as possible. For example lead is difficult to remove from leaded brass; hence leaded alloys should be kept separate from zinc or tin alloys. Similarly antimony is difficult to separate from copper-base alloys; and aluminium, silicon and manganese cannot be separated from copper base alloys containing high percentages of zinc without losing a large amount of zinc. Hence it is necessary to segregate these different kinds of alloys in order to facilitate recovery of the metals and also to fetch a higher price for the scrap. Segregation should as far as possible be done right at the source of the scrap producing unit. Separate containers with large markings should be provided in the machine shops, etc., and the workers should be instructed to put their scrap only in particular containers.

Rapid Scrap Identification Test.—Inspite of the care taken to segregate different kinds of scrap mix-ups are likely to occur. When this occurs a rapid identification test becomes indispensable. The table* on page 195 summarises some of the so called spot tests which are explained below:—

(1) *Nitric acid test*: Place 1 or 2 drops of concentrated nitric acid on clean metal surface. Observe any reaction for 1 to 2 minutes. Then dilute with 3-4 drops of water and observe the reaction. If solution turns green or red use it for the iron nail test.

(2) *Iron nail test*: Rub a clean iron nail in the coloured acid solution in contact with the specimen. If the alloy contains copper, copper will be deposited on the nail or the metal surface.

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* *Metals and Alloys* August 1942, p. 365.

Material	Nitric acid test	Iron Nail Test	Ammonia Test	Paper Test	Silver Nitrate Test
Nickel	Reacts, dl slowly, pale green solution.	Negative	Blue	Intense red colour	......
Monel Metal ...	Reacts, greenish blue solution.	Copper plates out	Dark blue	Intense red colour	......
Nickel Silver ...	Reacts bluish green solution.	Copper plates out	Dark blue	Red colour varies in intensity with nickel content.	......
Brass	Reacts vigorously, green solution.	Copper plates out	Dark blue	......	......
Tin Bronze ...	Reacts vigorously, blue-green solution.	Copper plates out	Dark blue	......	......
Aluminium Bronze ...	Reacts vigorously	Copper plates out	White precipitate blue solution.	......	......
Copper	Reacts vigorously, blue-green solution.	Copper plates out	Dark blue	......	......
Aluminium ...	Soluble	......	White precipitate	......	......
Magnesium Alloy ...	Soluble	......	Colourless	......	......
Lead	Soluble	......	Colourless	......	......
Lead Silver Solder ...	Soluble	......	Colourless	......	No precipitate in absence of tin.
Lead-tin solder ...	Soluble	......	Colourless	......	Black deposit with white precipitate.

(3) *Ammonia test*: Dissolve a bit of the metal in nitric acid, or attack the surface with a few drops of the acid. Dilute somewhat and add ammonium hydroxide to the solution until the latter is strongly alkaline. If copper or nickel is present a pale blue precipitate will be formed which on further ammonia addition becomes a dark blue solution.

(4) *Paper test for nickel*: Put one drop of a mixture of 10ml H^2SO^4, 10ml HNO^3, 10ml H^3PO^4, 10gm. nitric acid and 25ml water on the metal for 15-30 seconds. Then absorb the drop on a paper test strip. (The test strip is made out of filter paper dipped in a solution of 10gm. nitric acid, 25 ml. water 10ml. of 1% dimethyl glyoxime in isopropanol and dried). When potassium hydroxide is dropped on this paper a red colour will form if nickel is present. There is no colour interference from iron or other elements.

(5) *Silver Nitrate test*: Treat the clean metal surface with a few drops of 2·1/2% silver nitrate solution. If tin is present a black deposit with white precipitate will form.

These spot tests are to be applied along with other tests which identify the broad classes of metals and alloys by colour, density, etc.

Re-processing Secondary Metal and Alloys for Recovery of Metals in the Virgin State.—As observed before one of the functions of the secondary metal industry is to reprocess the scrap in order to recover the metals in their original virgin state. This is a costly processing and is carried out only when the scrap is contaminated to such an extent that it cannot be employed directly to make standard alloys. In other words when the ratio of the element present in the scrap or the nature and amount of elements present is such that for all practical purposes the scrap or drossings, skimmings, etc., serve only as raw materials (like ores or concentrates) for recovery of the metals. Hence reprocessing is necessary:

(1) when the metal is oxidised or entrapped in drosses, slags, skimmings, etc.

(2) when the impurities present cannot be removed easily, and

(3) when the ratio of the metals present does not allow the manufacture of standard alloys, directly from the scrap.

There is not much difference between the reduction operations employed for the reprocessing of secondary metals and those employed in the conventional methods using ores or concentrates. Cupolas, blast furnaces or reverberatory furnaces are generally employed for these operations and fluxes and reducing agents are used for elimination of impurities. The refining of these metals is also carried out in the conventional ways.

Manufacture of Standard Alloys from Scrap Metals.—The manufacture of standard alloys from scrap is the most important function of the secondary metal industry. In almost all cases it is necessary to add additional amounts of metals to the scrap composition in order to bring it to a standard specification. However, it is not necessary to use virgin metals to bring about this readjustment since the same results can be obtained by adding proportionate amounts of other grades of secondary metals and alloys. The service of a good chemist at this stage is indispensable. A paper, dealing with chemical control in a shop making brass from all-swarf melts, by Pollak and Lallowe has appeared in the "Metal Industry" of April 6 and April 13, 1945. This paper deals with preliminary preparation and rapid methods of analysis of different elements for quick adjustment of brass melt compositions and must prove useful to brass remelters.

The types of secondary metals that can be used directly for alloying may consist of such industrial scrap as borings, turnings, clippings, punchings, etc., or scrap like wire, sheet, rods, pipes, utensils, castings, etc. This scrap must be graded according to its different ultimate use and must be stored when different grades are mixed together. Very often scrap has to be cleaned. Iron and steel pieces can be removed by an electro-magnet placed under a moving belt over which the scrap is spread. Oil can be removed from borings, turnings, etc., by using an inclined revolving furnace with a gas flame. The

oil burns off leaving clean scrap. This can then be directly charged in a melting furnace. In many cases it becomes necessary to shape the scrap for furnace use by shearing, baling, etc.

For chemical analysis of the scrap, a proper sampling method must be used to make the sample representative of the whole lot. Different grades of scrap can be melted separately and analysed, after which different weights of the several grades can be calculated out to make a standard composition. The types of furnaces used can either be electric, gas or oil fired and even coke furnaces can be used. Much of the success of the operation depends upon the furnace temperature and atmosphere. In certain cases fluxes will have to be used not only to get rid of non-metallic impurities but to remove certain undersirable metals which might contaminate the alloy composition.

It must be borne in mind that not only the chemical analysis but also the physical properties of the alloy composition aimed should conform to a standard specification. After removal of the minute impurities through fluxing and refining the metal must be sound and uniform in structure. The final success of the operation depends on the melting practice and control of operations by a trained supervisory staff backed by a progressive management. Many instances are available of the management having no melting shop experience interfering with the work of experienced shop superintendents. This works to the detriment of the industry and should be avoided.

So far general points regarding the treatment of secondary metals have been dealt with. The following paragraphs will deal with some important metallurgical aspects.

Secondary Brass and Bronze.—In this group may be included high-tin-low-copper alloys with very low lead, red brasses, leaded yellow brass, leaded bushings and bearing alloys, manganese bronze, silicon bronze and aluminium bronze.

In general in the manufacture of these alloys, the secondary metal is first sorted, melted and cast separately. These casts are then analysed and a charge for a standard alloy is calculated out and weighed amounts of the various grades are then melted in a suitable furnace. Air is blown through the melted charge to

rid the metal of detrimental impurities or reduce them to specification limits after which they are skimmed off with the aid of a flux. The bath of metal is then poled with wood, chemically tested before and after any additions are made to bring it upto specification and finally poured into ingots and castings, after which a final chemical and physical examination is made. The physical properties of the final product will depend on several factors like:

1. Pouring temperature.
2. Melting practice.
3. Pattern equipment.
4. Sand condition.
5. Gates and risers, etc. Reliable temperature measuring instrument, sand control, etc., are to be deemed absolutely essential.

The high-tin-low-lead alloys require no unusual foundry technique. However, in melting this kind of scrap care should be taken to use as little virgin tin and copper as possible which can be done by aiming at a specification which requires slightly lower amounts of tin.

The technique for casting red brasses and leaded bushings and bearing alloys is very much simplified and the casting can withstand considerable pressure. The leaded yellow brasses, however, do not cast very well. The metal is not as fluid as in the case of red brasses and clean castings are difficult to obtain. Zinc fumes are also given off which are a health hazard. These alloys are now replacing high copper alloys for low-pressure and structural castings.

The manganese and aluminium bronzes have high strength and hardness combined with resistance to sea water corrosion. Special foundry practices are necessary for casting these alloys because of high shrinkage requiring large risers. Turbulance during pouring should be at minimum. Silicon bronzes also present some difficulties during casting but not as much as the other bronzes. Great care should be taken to keep the silicon bronzes separated lest they get mixed with leaded bronze alloys where silicon is a harmful impurity.

Secondary Tin and Lead Alloys.—The description and class of secondary tin and lead alloys available along with its approximate composition and possible disposition is given in the following table compiled by G. L. Behr*. India does not produce any tin or lead. Hence the available secondary tin and lead should be used as carefully as possible and melting losses should be kept low.

It is desirable to segregate the different kinds of secondary lead and tin alloys as much as possible in order to avoid undue difficulties during reprocessing. However, it is not always possible to be able to buy segregated scrap and for that reason it becomes necessary to refine these secondary metals, *i.e.* to remove the undesirable metals either by adding another metal with which the undesirable metal alloys preferentially or by means other than those involving the use of added metals.

In cases where another metal is added for refining there forms an alloy, or intermetallic compound, of the added metal with the impurity which crystallizes as a crusty layer on the surface of the melt and can be removed easily. A very good example of this method is the Parkes process of desilverizing of softened lead in which zinc is added to form a zinc-silver alloy which is removed and treated for silver recovery.

The other methods of refining depend on the chemical re-activity of the elements to be removed. Oxidation and chlorination are the common means of getting rid of the undesirable elements which have a higher affinity for oxygen and will be oxidised in preference to other elements. In this connection the following table of the heats of formation of metal oxides will be found useful. Those metals whose oxides have a higher heat of formation can be easily removed from an alloy of several melts.

Metal Oxides	Heats of formation cal per mol for one atom of oxygen
CaO	151·7
MgO	146·1
Al_2O_3	126·6
Na_2O	99·45

* *Metal Technology* T. P. 1642 October, 1943.

Metal Oxides	Heats of formation cal per mol for one atom of Oxygen
ZnO	83·5
SnO_2	69·05
SnO	67·7
CdO	65·2
FeO	64·3
NiO	58·4
H_2O gas	57·8
Sb_2O_3	55·1
PbO	52·46
As_2O_3	51·36
Bi_2O_3	45·7
Cu_2O	42·5
TeO_2	38·8
CuO	35·5
PbO_2	32·5
Ag_2O	6·95
Au_2O_3	3·66

Behr* gives the following list of the principle refining operations performed on secondary lead, tin and their alloys

Elements to be removed	Removal Reagent
Copper	Sulphur Aluminium
Zinc	Oxidation Sulphur or sal ammoniac Chlorine Caustic soda Lead Chloride
Arsenic	Oxidation Zinc Aluminium
Tin	Oxidation Caustic soda plus an oxidising agent Chlorine Lead Chloride

* *Loc. cited.*

Elements to be removed	Removal Reagent
Antimony	Oxidation Aluminium Sodium
Lead	Chlorine
Iron	Sulphur Aluminium

General Class of Secondary Metal	Approximate Composition	Possible Disposition
Jewelry Metal ...	Over 90% Sn+Pb+Sb+Cu	Tin base babbit by lead removal or solder by Sb and Cu removal.
High-grade Babbit ...	Over 70% Sn+Pb+Sb+Cu	Same as above.
Solder	Sn and Pb+anything	Solder.
Electrotype Metal ...	3·5 Sn, 3·5% Sb, balance Pb.	Antimonial lead by tin removal.
Type Metal	3 Sn to 6%, 8 to 15% Sb, balance Pb.	Type metals or lead base babbit Antimonial lead by tin removal.
Tinny hard lead ...		
Lead base Babbit ...		
High-tin Antimonial lead	12 to 20% Sn, 10%, balance Pb.	Type metals or solder.
Cable lead	2 to 3% Sn	Common lead uses.
Scrap lead, sheet and pipe ; Drosses of the above.	Very dirty common lead.	
Battery Plates ...	4% Antimonial lead	Antimonial lead or conversion to soft lead.

The sodium or aluminium, remaining in the melt after refining is complete, can be removed by oxidation, steam, sulphur or sal ammoniac. Poling or steaming is also used for cleaning up the melt.

The choice of the removal reagent needs some thought. Costly reagents should be avoided as far as possible. For instance in decopperising with sulphur one pound of sulphur will remove about three pounds of copper and in doing so produce about thirty pounds of dross depending upon the composition of metal. Sulphur is not very efficient or economical while aluminium is highly reactive and can be used for the removal of iron, arsenic, copper and antimony from lead tin alloys. Since iron, arsenic and copper are objectionable elements and antimony needs to be reduced in most reconversion practices, aluminium is a better refining reagent for solder alloys. Each pound of aluminium will remove about three to four pounds of the above elements. If higher amounts of tin are present in the alloy the action of aluminium is more efficient than when the percentage of tin is low. After adding the aluminium the melt is stirred and its temperature raised till all the aluminium is melted. The melt is then cooled slowly when a crust forms on the surface which contains all the impurities and is removed.

Zinc when present can be removed by selective oxidation after raising the melt to a cherry-red heat. Chlorine can be used to remove zinc but it takes a special apparatus and a long time. Caustic soda though an excellent zinc remover should not be used when tin is present unless the tin is also to be removed. Lead chloride can be used to remove zinc, aluminium, sodium or any other metal higher in the chlorine series of heats of formation than lead.

Arsenic is easily removed from lead-tin alloys. Powdered zinc can be used which also removes copper. Aluminium is not a very selective arsenic remover in the presence of tin and antimony. It should be avoided for arsenic removal as far as possible because of the danger of producing toxic arsenic gas in the presence of nascent hydrogen by wet aluminium-arsenic comound.

It is not generally necessary to remove tin from lead-tin alloys. However tinny hard lead containing 8-15% antimony can be converted to antimonial lead by tin removal. Molten caustic soda with steam as an oxidising agent is perhaps the best way to remove tin. The processes of tin removal by chlorine and lead chloride are patented in America.

Antimony is best removed by oxidation. However, when tin is present aluminium should be used in order to conserve tin. Use of metallic sodium for antimony removal is quite novel in that the melt is solidified after addition of sodium and the crust formed on top is dissolved by molten caustic soda which is then ladled off.

Sometimes in contaminated tin-base metal it is necessary to remove lead. This is done by passing chlorine gas. Iron as mentioned above is best removed by aluminium.

Secondary Aluminium.—Immediately after the war there will be large quantities of secondary aluminium available. The proper utilisation of this material is of great importance in Indian economy because of the high prices of virgin aluminium now prevailing. Aluminium unlike copper or lead is very easily oxidised and for that reason it is not possible to refine it by ordinary metallurgical processes. There is, however, the famous Hoops process in which impure aluminium is re-electrolysed to produce 99·99% pure aluminium. This process being very costly and requiring elaborate apparatus is out of the question. The best possible way in which secondary aluminium can be utilised is for the manufacture of standard alloys if the scrap is properly segregated or for degrading virgin aluminium. Fluxing of the melt by chlorine gas is recommended.

Aluminium alloys can roughly be classified into common or non-heat-treatable and heat-treatable alloys. These are again divided into cast alloys and wrought alloys. Very broadly it can be said that alloys containing copper magnesium and nickel are strong or heat-treatable alloys while those containing manganese, iron or silicon are non-heat-treatable.

In order to promote the increased use of a secondary aluminium it is necessary to know what the scrap consists of. If it is segregated scrap of standard alloy and has not been contaminated the best way to use it would be by mixing it with primary metal for the production of an alloy of the same composition. The controlling factor in deciding whether scrap or remelted ingots can be used for this purpose is the composition. In case of wrought product the elements to be considered

are iron, silicon, zinc, tin and lead which are mostly there as impurities while in casting alloys magnesium also needs consideration along with the other impurities.

The problems that arise out of not segregating the aluminium scrap are so many that it becomes difficult to find a use for such metal. In cases where contamination is not serious small amounts of this metal may be added in similar alloy metals. Of course the problems of utilising such scrap arise only when standard alloys are attempted. In India where almost any kind of aluminium is used by the small utensil manufacture with complete disregard as to the corrosion resistance, etc., of the final product, and where moderate drawability, spinnability or castability is the only criterion for selection of the metal, utilisation of this kind of scrap has presented few headaches. In order to identify different aluminium alloys the following spot tests may be used:—

Chemical required.

20% caustic soda solution

30% nitric acid

50% ammonia solution

1% alcoholic solution of dimethyl glyoxime.

(*i*) *20% Caustic Soda*—A drop of 20% caustic soda solution is applied to a cleaned surface of the metal and allowed to react for 3 to 5 minutes. The surplus liquid is then removed with blotting paper and the colour of the resulting stain is observed.

WHITE stain indicates, pure aluminium or magnesium alloy.

GREY-BROWN Loose stains indicates a high silicon aluminium alloy.

BLACK adherent stain indicates either Duralumin or Hinduminimum R. R. type alloy.

(*ii*) *30% Nitric Acid*—One drop of 30% nitric acid is then added to any coloured stain produced by the caustic soda solution. If complete solution of the

stain does not take place a high silicon content is indicated.

(*iii*) *50% Ammonia Solution*—Two drops of a 50% ammonia solution are added to the drop of acid whatever may have been the action of the latter on the original stain.

BLUE colour formation indicates the presence of copper in alloying quantities.

(*iv*) *1% Alcoholic Solution of Dimethyl Glyoxime*—Finally one drop of a 1% alcoholic solution of dimethyl glyoxime is added.

Brilliant RED colour spreading over the spot in 1 minute shows the presence of appreciable quantities of nickel.

Faint RED edge to the spot merely indicates a trace of nickel as an impurity.

Secondary Magnesium.—All the remarks about segregating secondary aluminium also apply to secondary magnesium. The variety of magnesium alloys are very few and the majority of both cast and wrought magnesium alloys contain aluminium, magnesium and zinc. Magnesium requires great care in handling and under no circumstances wet scrap should be stored, shipped or recovered because of the danger of hydrogen evolution leading to spontaneous combustion. Magnesium base alloys are easily indentified by a silver nitrate spot test. The silver nitrate turns jet black on magnesium and remains colourless on aluminium. Magnesium scrap is not generally baled because of the lower magnesium recovery on baled magnesium. Copper, silicon, iron and nickel are harmful impurities in magnesium and care should be taken not to contaminate the scrap with these materials.

The melting and casting of magnesium require special precautions. Melting is generally done in cast iron pots and gas or oil is used as fuel. Fluxes with magnesium chloride base with other halide salts are added both for refining and protective action. After melting is completed the metal is raised to a temperature of 800 to 900°C before casting. Unlike

aluminium the higer temperature refines the magnesium grains. Sulphur is used as a protective flux while pouring magnesium alloys. In cases where a magnesium fire breaks out care should be taken not to use water or any other extinguishers except those specially recommended to extinguish magnesium fires. These recommended extinguishers should be kept handy and the workmen instructed in their use.

In conclusion it must be said that in India a secondary metal industry is as important as starting new non-ferrous metal industries. India is lacking in workable ore deposits of most of the non-ferrous metals, and before the war most of her requirement of non-ferrous metals were met by imports. The present war has brought home the need of a sizable metal industry in India. Every pound of lead, tin, copper or other metals salvaged will add to the self sufficiency of the country. However all such salvages must be done under expert metallurgical advice to avoid waste.

Name of the metal.	Uses	Indian Production	Indian Imports.	International Control.
Lead	Its different alloys are used for a large variety of purposes in Chemical plants. Lead Calcium alloys upto 0·1 per cent are used for grids and plates for storage cells, cable sheathing and other purposes. The largest amount of lead is consumed in the manufacture of accumulator plates, pipes and foils. Lead is also an essential component of solders, type metals and bearing metals. Lead compounds are extensively used as pigment (white lead, red lead, etc).	*Indian Lead Production* About 100 tons a year. *Lead Pipes* The 1938-39 import of lead pipes was about 500 tons. A lead extrusion press has been installed in Calcutta during the war and at present produces 500 tons of lead pipes from 3/8″ to 6″ internal diameter. The production can be stepped up to 600 to 800 tons if required.	India imported about 7,500 tons of lead both wrought and unwrought in 1938-39.	No attempt was ever made by the lead producers to come to any agreement till 1931 when non-United States producers came to an agreement to cut down production by 20 per cent. In March of the next year the Cartel dissolved and prices dropped sharply. The combined effort of sterling devaluation and the imposition of a British tariff on non-Empire lead, destroyed the Cartel. Nevertheless restrictive measures by the International Zinc Syndicate indirectly imposed partial restriction on lead due to the fact that lead and zinc are often mined together from the same mines. In 1935 a new arrangement was arrived at by the lead producers. This was a very flexible arrangement which did away with

	Lead Sheets So far the Indian producers have not attempted to roll sheets wider than 3 feet. Demands for sheets up to 8 feet width are considerable and are likely to increase in the future. A mill producing wider sheets would be welcome by the chemical industries. Aluminium foil can be advantageously used for tea chest lining instead of lead. A Calcutta concern is switching over from lead to aluminium foil production.		the quota system of production but agreed not to increase output without due notice.

Name of the metal.	Uses.	Indian Production.	Indian Imports.	International Control.
Lead— *Contd.*	......	*Accumulator Plates.* Accumulator plates required for secondary batteries are produced at Bangalore, Bombay, Calcutta and other places. It is possible to produce all the Indian requirements indigenously.		
Aluminium	Its uses both as metal and in the form of strong alloys are innumerable. They are in the field of transportation—air, road, rail and water—for overhead transmission lines, in the chemical, brewery and food industries generally, in building and architecture, for packing and insulation in the form of foil, for painting in the form	About 200 tons a month which is capable of being increased to 650 tons.	Highest in 1929-30 it was about 8,500 tons. In 1938-39 it was about 3,000 tons.	The aluminium industry during the half century of its existence has always been dominated by a small number of firms owing to (1) the large investment required for the electrolytic separation of the metal, (2) the limited supplies of the economic raw materials, (3) the complexity of production processes and (4) the opposition of establish-

of powder and paste and in the kitchen in the form of utensils. Aluminium can be anodized and dyed giving very pleasant and striking decorative colours. Anodized aluminium is also used as reflectors and has remarkable corrosion and abrasion resistance.

Aluminium is seldom used in the pure form for structural purposes but is alloyed with copper, manganese, silicon manganesium, nickel, zinc and other metals to produce a series of alloys with widely varying properties. The so called "strong alloys" of 'duralumin' type are generally alloys of aluminium with up to 4 per cent copper and minor quantities of magnesium and manganese. The "Y" and "RR" alloys contain nickel along with the above alloying elements. These alloys develop their strength on heat treatment.

ed interests against the rise of new ventures. Before the first world war four companies in Europe and one in America controlled the output. The war saw tremendous development in aluminium industry and because of its importance in modern warfare governments in different countries fostered domestic aluminium industries. In 1931 a strong cartel was set up and incorporated as the Alliance Aluminium Company of Basle. It rigidly limited output by setting up quotas to be enforced by periodic audits. The life of the cartel was to be 99 years but we understand that the cartel was dissolved during the war period.

Name of the metal.	Uses	Indian Production.	Indian Imports.	International Control.
Copper	The application of copper and copper alloys covers a wide field and in normal times is confined to the following: 1. Electrical manufactures. 2. Buildings. 3. Automobiles. 4. Telephone & Telegraphs. 5. Shipbuilding. 6. Railway equipment. 7. Other uses including kitchen utensils, coinage and general engineering. The main copper alloys are Brasses (alloys of copper and zinc), Bronzes (alloys of copper and tin), Monel metal (30% cu. + 70% Ni). Nickel	India produces about 6,000 tons of fire-refined copper per year all of which is convereted into brass sheets.	*Imports of Copper and Brass into India* Imports of copper both wrought and unwrought excluding telephone and telegraph wires—amounted to about 8,500 tons in 1938-39 and that of brass about 16,000 tons in the same year. Copper is imported in several alloys, electrical equipment, machinery, etc., besides being imported in the pure form either as ingots or as wrought copper. A large quantity of secondary copper is also	After the war of 1914 world producing capacity increased with the development of new low cost producers, while world consumption failed to keep pace even before 1929 and fell sharply during the depression. In the face of this situation prices were maintained at an artificially high level for a time by a world cartel. They then collapsed disastrously. In 1926 the U. S. producers organised Copper Exporters Inc., who took foreign firms as non-voting members. The purpose of this organisation was to eliminate middlemen, prevent manipulation and "stabilise prices." The stabilisation of prices turned out to mean stabilisation upwards which at one time went up to 24 cents a pound. This of

Silver (alloys of copper, zinc and nickel), Beryllium, Copper (copper plus 2 to 4% beryllium) and Duralumin (alloys of aluminium with about 4% copper).		used. A fair estimate of pre-war consumption of copper in all forms would be between 35,000 and 40,000 tons per year.	course came crashing down when the controls cracked. In May 1932, most of the foreign firms resigned from Copper exporters Inc., and in 1935 came to an agreement which provided for a co-operative marketing and price policy among the non-United States producers. The participants in the International Committee were all low cost producers who concentrated on increased production rather than higher prices. In January, 1937, the Cartel removed all restrictions on output announcing at the same time that should the prices fall far below the current level, restrictions would be resumed. Copper prices have since risen strikingly.

SECTION IV

1—MACHINE TOOL INDUSTRY

Introduction.—Before we introduce the subject of Machine Tool Industry, it would be worthwhile to make general observations on machine tools as such because very little is known of this industry in this country. Machine Tool Industry is an industry about which so little is known but whose products are nevertheless in this mechanical age the indispensable prerequisite of all forms of production whether for the needs of peace or the waging of war. The machine tool which may be an intricate piece of mechanism no longer than a sewing machine or a mechanical monster as big as a locomotive is the productive element directly responsible for manufacturing arms and ammunitions, vehicles, engines, ships, aircraft, buttons on a soldier's uniform, the can which contains his bully beef and so on throughout the list of engineering products manufactured. It is indirectly responsible for the production of every yard of fabric and the ploughing of the land for by its means the loom and the plough are produced.

The theoretical economist classifies the factors of production as land, labour and capital; but to the planner of war production the trio appears in the guise of man-power, materials and machine tools and the greatest of these is often machine tools. It is not often, however, that machine tools appear thus as a direct and primary contributor to production. They do so in war time only because machinery and metal goods generally are the end-products of war production; they are what the community most wants to consume. In peace time not much metal is directly consumed, and the chief need for machines is to serve as producers goods—*i.e.*, to assist in making other goods for consumption. Machine tools are producers goods in the second degree—they are needed to assist in making machines which assist in producing for consumption. This means that the makers of machine tools inevitably suffer from the extremes of prosperity and depression. The baker does not do much more business in good years than in bad. The maker of bakery machines has a more irregular business since he gets order only in the baker's good years. And the maker of machine tools to

make baking machinery can expect to be busy only when the maker of baking machinery is so busy that he needs to expand his capacity. The example is over simplified to the point of caricature but it indicates the nature of the economic climate in which the machine tool maker lives.

Definition of Machine Tools.—There are many variant definitions of what constitutes a machine tool. But broadly speaking the term can be taken to cover any power driven apparatus for working on metal. The lathe with its many decendants is the essential tool but machines for plaining, drilling and stamping metals also fall within the definition. The National Machine Tool Builders Association of America has defined machine tools as "power driven complete metal working machines, not portable by hand, having one or more tool and work holding devices used for progressively removing metal in the form of chips."

Machine tools are made in an enormous variety and designs for both general and special purposes. The special purpose designs are used, as the name implies, for operations which are repeated often enough to justify the cost of an entire machine, and to keep it busy for enough hours of the working day on that work. As a rule these machines do not allow of much change between one part and another.

The standard machine tools—the engine lathe, the shaper, the plainer, the horizontal boring machine, the vertical boring mill, drill press, the milling machine and a few others will do practically all the operations required in the general machine shop.

The normal roster of makers of machine tools in India includes the plants of the old established firms with a few more which have come in the field during the war and includes about 120 names.

Beginning of the Industry in India.—Although there was no regular Machine Tool Industry in India before the war, various machine tools were made in the larger factories occasionally. When war threatened the Allied Nations, Britain was short of every item of industrial products needed for the successful prosecution of the war, but what was worse, she was faced with a tragic deficiency of machine tools. Those who

understood the position were seriously alarmed lest the bold schemes for increasing production of war requirement should fail for want of machine tools. It was at this critical juncture that His Majesty's Government became anxious for the development of the Machine Tool Industry in India. In the year 1941 when due to the fall of France, the responsibility of carrying on war against Germany was shouldered by Britain, she was entirely dependent on the help India could give her. India should be proud to know that her Machine Tool Industry which had just begun to make a beginning rose to the occasion, although gravely handicapped by an all too late start.

Before the war Machine Tool Industry in India was practically non-existent. When it is remembered that the actual time needed to produce a machine tool may according to its nature, be anything from 3 to 18 months or more the magnitude of the task facing the Government may be partly realised.

Two methods of overcoming the difficulty were adopted: *firstly*, the Government of India declared to control and license the Industry with a view to introducing rationalisation into the Industry and *secondly* the Government of India determined to gear up the Industry for intensive production which during the war reached peak figures.

Early efforts in the country for the manufacture of machine tools were made in 1937 when in addition to Messrs. P. N. Dutt and Co., Ltd., Calcutta, Messrs. Cooper Engineering Ltd., Satara, and Messrs. India Machinery Co., Ltd., Calcutta, undertook the manufacture of machine tools. When the war broke out, Government of India began to explore the possibilities of manufacturing more machine tools in the country. In 1942 the Government of India appointed the Machine Tool Controller and a system of licensing was adopted. During 1942 the Machine Tool Controller realised the necessity of increasing production of machine tools in India. A scheme was evolved for the expansion of five of the more experienced machine tool manufacturing firms in India with a view to increasing their combined production to 250 machines per month. Schemes were also drawn up for balancing these five firms' existing plants and necessary plants were brought from the U. K., and the U. S. A., and were sent to these firms.

The following table will give the dates of commencement of the factories which are in the membership of the Association:—

Name	Year.
(1) Messrs P. N. Dutt & Co., Ltd.	1930
(2) India Machinery Co., Ltd.	1937
(3) Hind Machines Ltd.	1942
(4) Indian Engineers' Corporation Ltd. ...	1943
(5) Investa Machine Tools & Engineering Co., Ltd.	1942
(6) Messrs. Cooper Engineering Ltd.	1937
(7) The Mysore Kirloskar Ltd.	1942

Thus from the above it would appear that the Machine Tool Industry is a war baby and has come to be established in India as a direct encouragement given by the Government.

Before the war hardly 100 machine tools were made in a year. As a result of Government encouragement about 350 machine tools were manufactured per month in 1944 *i.e.*, 4,200 machine tools a year. With the adoption of India as the first base for operation by the South East Asia Command, it had become very important that India should have an adequate supply of machine tools for the repairs and maintenance of aircraft and aircraft ordnance, naval and civilian ships, motor transport vehicles, locomotives and rolling mills, etc.

War-time Control.—With the collapse of France and the entry of Italy into the war, India was virtually cut off for all imports from the U. K., and the U. S. A., and was forced to rely on her own production. The Machine Tool Controller was, therefore, faced with the task of meeting by local production as much as 60 per cent of India's requirements within the shortest possible period. This involved a rapid expansion of the Machine Tool Industry in India. With this end in view every manufacturer who showed any interest and possessed the necessary plant and machinery was encouraged to undertake the manufacture of machine tools. In the beginning the licences were granted freely but the need for rationalisation was realized at a later date.

The Machine Tool Controller realising the necessity of having a reserve supply of machine tools to draw on, and

having been refused a reserve of imported machine tools, evolved a scheme, as pointed out already, for the expansion of five of the more experienced machine tool manufacturing firms in India, with a view to increasing their combined output by a further 100 machines per month. Schemes were drawn up for balancing these five firms' existing plants and the U. K. and U. S. A., authorities agreed to supply the required plants.

In furtherance of this expansion scheme, the Machine Tool Controller, sent a team of technicians to assist the Industry on technical manufacturing problems. Mr. Oldfield and Mr. Trubshaw were sent out at the head of this team of technicians who were posted to the various manufacturing sections in Bombay, Lahore and Calcutta.

The first of the technicians' tasks was to survey the Industry with a view to rationalisation and secondly to lay down standards by which manufactured machines could be distinctively graded according to their accuracy and quality.

This was achieved and the Machine Tool Controller placed bulk orders on five firms who were considered by the Machine Tool Engineering Adviser (Mr. Oldfield) as capable of producing machine tools of high grade and on semi-production basis. These firms were given assistance by way of balancing plant in order that production may be accelerated.

Bulk-ordering of Machine Tools by Government.— About that time, Government also decided to take over the ordering of all the machine tools required for the country and their distribution. Thus all orders for machine tools, even those by industrial users, were aggregated and contracted for by Government, who also arranged for the re-sale of the machine tools to the industrial users. It was for rationalising production that Government took up this burden on itself. It was not advisable to allow too many people to take up machine tool production. Licensing had to be limited to those who had fair chances of success in making machine tools of reasonable standard. It was also necessary to make some firms specialise in this and even they should limit themselves to production *on a mass manufacture basis of only a few types of machine tools for which they had the equipment.* Such has been the principle which regulated machine tool production in the U. K.

Most firms in India took up the manufacture of machine tools as a side line. The only concern set up for the sole purpose of producing machine tools was Mysore Kirloskar Ltd., (Harihar), which owes its origin to the well-known Kirloskar Bros. of Kisloskarvadi, a firm which has long been engaged in making pumps and agricultural implements. The new company started work at Harihar in 1942.

The idea of industrial concerns making their own machine tools was also deprecated. At a time when there were no specialised producers, this was perhaps justified, but this has to be discouraged when production on a mass manufacture basis is adopted.

Therefore, the policy of the Government based on (*a*) selection of the most promising firms for a specified number of items and (*b*) bulk manufacture, seemed essential for fostering the industry in the then existing circumstances.

Location.—The industry is localised in Calcutta, Bombay, the Punjab and the Mysore State. From the point of view of market, the industry is well spread over and its regionalised position must be considered as favourable. From the point of view of labour the industry in the beginning had to depend to a certain extent upon the available labour in the factories because the manufacture of Machine Tools to begin with was started by old concerns who were engaged in other lines of production also. But for the immense expansion that took place during the period of war the industry had to draw upon mainly new recruits who had to be trained. The important raw materials are available in the country. Thus the industry has all the natural advantages for its development.

Raw Materials.—The important raw materials required by the industry are iron and steel, non-ferrous metals and ball-bearings. All the raw materials except ball bearings are locally available in the country.

Production.—The Machine Tools manufactured in India comprise among others, lathes, drilling machines, plaining machines, shaping machines, milling machines, sawing machines, grinding and polishing equipment and presses, punches and shearing machines. Before the war India produced about 100

machines but now it has reached the figure of 4,000 machines per annum. During the last five years between 1940-46 the production stood at the following figures:—

Grade	Number	Average per year
Grade I	8,983	1,796
Grade II	1,822	364
Grade III	1,171	234
Ungraded	14,894	2,978

From the above table it would appear that on an average the production of graded machines came to about 2,594 and that of ungraded to 2,978. In terms of value graded machines all put together came to about 75 lakhs of rupees and ungraded machines to rupees 31 lakhs. Thus the total number of machines manufactured comes to 5,374 and their value to rupees one crore and 5 lakhs per annum.

On an average during 1942-44 the imports of machine tools amounted to 5,200 in number and rupees 3,15,00,000 in value.

It has been found out that on an average India imports machine tools to the tune of rupees three crores. During 1946, however, the imports amounted to 9,376 in number and rupees 5,64,00,000 in value. During the same year the domestic production was as follows:—

Grade	Quantity	Value
Grade I	3,578	7,200,000
Grade II	380	1,200,000
Grade III	163	3,000,000

During the last six years the production of machine tools has been perfected to a high degree of efficiency. The industry has improved regarding the proper wear resisting and seasoning quality and various other aspects which are very essential to ensure that the consumer gets his money's worth. The present productive capacity of machine tool industry is estimated at 7,500 numbers per annum.

Difficulties of the Industry.—The difficulties of the Machine Tool Industry arise out of its infancy and the shortages of suitable machinery and raw materials. As has been pointed out in the earlier section the industry is largely a product of the war and hence it could not get sufficient time to adjust itself to peace-time conditions. On account of the re-adjustment problems the industry needs protection against foreign competition.

Tariff Board Enquiry.—The industry applied for Tariff Protection and the Tariff Board have recently concluded their inquiry. Machine Tool is an industry which bristles with great many difficulties at every stage. If the plan of large-scale industrialisation of India is to be achieved it becomes essential that we must get as many machine tools as possible and at as cheap a price as possible. Anything that impedes the supply of machine tools would be a serious bottleneck in the industrial development of the country as a whole. If the production costs of Indian industries are to be kept at a level which would enable us to compete with foreign imports, it necessarily follows that the machine tools used by Indian industries should be cheap. This difficulty the industry foresaw and explained to the Tariff Board that an enhancement of duty on foreign imports would not be a proper method of protecting the industry as it would increase prices.

The industry suggested restrictions of imports of the types of machine tools manufactured in India and to the quantity in which they were manufactured. The industry is prepared to have the strictest possible control in order to ensure quality and reasonable price. The report of the Tariff Board and the action of Government of India thereon are awaited.

Conclusion.—The importance of the Machine Tool Industry to the national economy of the country is very great. The

expansion of the industry which has taken place during the last seven years has shown beyond doubt that given proper assistance the industry is able to develop on scientific lines. When it is remembered that in 1939 only about 100 machines per annum were manufactured and in 1943 the production rose to over 6,000 machines per annum, we can understand that there is potential capacity in India to develop and establish this industry on a large scale. In a country like India where industrialisation on a planned scale has just begun, a flourishing Machine Tool Industry would be a powerful factor in the establishment of new industries and the development of existing ones. A Machine Tool Industry cannot well exist anywhere but in a large industrial country and we feel that the plans of industrial development that are under consideration in India will provide the Machine Tool Industry with a great opportunity. "Just as cotton is the first industry to be set up when an agricultural country embarks on industrialisation, so the manufacture of machinery will be the last but one, and machine tools last of all." Lack of success to the Machine Tool Industry would be a great blow to the national economy of the country and, therefore, the maintenance of a strong Machine Tool Industry as a part of public policy is extremely necessary.

2—SMALL TOOLS

Introduction.—Small tools comprise the following:—

(1) Hand tools, such as pic axes, shovels, chisels, hammers, screw drivers, etc.

(2) Wood working tools.

(3) Metal cutting tools like twist drills.

An exhaustive list of the various items which are grouped under this head is given below:—

1. Twist Drills.
2. Reamers.
3. Milling Cutters.
4. Broaches.
5. Taps, Dies and Punches.
6. Special form tools.
7. Chasers.
8. Straight edges.
9. Vices.
10. Surface plates.
11. "V" and other Blocks and Clamps of all types and sizes.
12. Angle plates.
13. Centres.
14. Steel squares.
15. All kinds of gauges such as ring and plug gauges, slips gauges etc.
16. Steel footrules.
17. Bevel Protractors.
18. Sine Bars.
19. Knurling tools.
20. Hack Saw Frames (Hand).
21. Dial Test Indicator Sets.
22. Drill Sleeves.
23. Drill Chucks.
24. Mandrels.
25. Lathe Chucks.
26. Augers and Bits.
27. Hammers.

Before the war the Small Tool industry was not very much developed. The indigenous production could meet only 10 per cent of India's total consumption, the remaining 90 per cent being imported from abroad. During the war the industry got a strong fillip. The centres of production before the war for light tools were Calcutta and Bombay, but during the war, Cawnpore, Lahore and Secunderabad attracted the industry.

In war-time the production of small tools has increased considerably due to stoppage of imports and the increased demand, the average annual production of some of the items being as follows:—

Hammers	...	...	...	5 lakhs.
Pliars	...	...	...	3 ,,
Chisels	...	...	...	3 ,,
Screw Drivers	...	...	...	3 ,,
Drills	...	...	...	4 ,,

Present position.—The small tools industry operating in India produces a large variety of small tools. There are several factories, big and small, the following being the important ones:—

1. The Indian Tool Manufacturers Ltd., Bombay.
2. The Bharat Tool Mfg., Co., Ltd., Bombay.
3. Messrs. Kamani Engineering Corporation Ltd., Lahore.
4. Messrs. Dolohar Ltd., Calcutta.
5. The Peepul Iron & Steel Industries Ltd., Cawnpore.
6. Messrs. Praga Tools Corporation Ltd., Secundrabad.
7. Messrs. J. K. Iron & Steel Co., Ltd., Cawnpore.

The tools manufactured by the Indian industry have now reached a high degree of precision. The industry is adequately financed and manned by suitable technical experts.

The production in the country has now reached a reasonable figure and is expected to meet a substantial portion of India's demand. The impetus given by the war made it necessary for the industry to augment its productive capacity. In certain items the capacity has far exceeded the requirements of the country.

Conclusion.—Small tools industry is an important industry for the industrialisation schemes and there is an urgent need for its development. The industry is before the Tariff Board for examination and its claim for assistance and protection, we hope, will receive due consideration.

SECTION V

MECHANICAL ENGINEERING INDUSTRY

Introduction.—Mechanical Engineering is that branch of the Engineering Industry which concerns itself with the shaping, processing and treating of metals. In India the industry first started with the repairing of machines, their parts and other mechanical appliances. First workshops established in India were established for repair purposes. During the second half of the nineteenth century textile industry and railway development in India had started and India's engineering industry was concerned mainly with the requirements of textile and railway repairs, for which very large and well equipped factories were started in various parts of the country. These factories actually became the neclus of the mechanical engineering industry in the country.

The second stage in the development of mechanical engineering industry envisaged making of parts of machines. It is not intended to suggest that the repair workshops in the later nineties could or did not supply machine parts. In the second stage of its development the manufacture of parts of machinery began on a sizeable scale. No statistics are, however, available of the number of such workshops or about their out-turn. But the industry did not develop till as late as 1932, when in addition to the steel and textile industries of India, the Sugar Industry was also granted protection and in the industrial renaissance after the depression other industries were developed.

The third period in the development of mechanical engineering witnessed the manufacture of industrial plant and machinery; machine tools and machines like oil engines, weighing machines, centrifugal and hand pumps etc.

Several of the engineering firms which can be grouped under mechanical engineering have both structural and mechanical workshops. Such firms are like Jessop & Co., M/s. Jas Alexander & Co., B. R. Herman & Mohatta Ltd. On the other hand there are firms, and a large number of them which are chiefly engaged in mechanical engineering *e.g.* Messrs. Jay

Engineering Works, Calcutta, Cooper Engineering, Satara, Messrs. Kirloskar Bros., Kirloskarvadi etc. But the important fact is that the development of engineering industries in India has not aimed at specialisation in this field.

A large number of the firms specialise in water fittings which are required in houses. The war of 1939 presented a splendid opportunity for the manufacture of machines and mechanical appliances but the opportunity could not be availed of to the full on account of lack of suitable technical knowledge of the industry and inadequate equipment. The development of mechanical engineering industry depends upon the availability of special classes of steel, the growth of foreign trade and forging. In-as-much-as India has recently made considerable progress in the manufacture of special steels, it augurs well for the future of the mechanical engineering industry.

On account of lack of statistical information regarding production, number of factories, India's requirements etc., it is not possible to make an exhaustive study of all the mechanical engineering industries. In the following pages we survey the progress of some of the important industries which are as follows:—

1. Industrial Plant and Machinery, like

   (*i*) Textile Machinery.

   (*ii*) Sugar Mill Machinery.

   (*iii*) Vegetable ghee plants.

   (*iv*) Chemical Plants and Machinery.

   (*v*) Machinery required for paper mills, cement factories, collieries and tea gardens.

2. Diesel Oil Engines.

3. Road Making Machinery.

4. Weighing machines and jacks.

5. Water-fittings.

6. Centrifugal and Hand pumps.

In addition to these relatively heavy types of engineering industries, there are light industries which come within the group of Mechanical Enginering. Examples of these are Agricultural Machinery, Sewing Machines, Hurricane Lanterns etc. These light engineering industries, we shall study in a later section.

1—INDUSTRIAL PLANT AND MACHINERY INDUSTRY

Under this head it is proposed to survey the progress made by the engineering industries which make machinery required by other industries. The range of manufacture under industrial plant and machinery is so varied that it is not possible for us to indicate all the items. In this section we study the following industries:—

(*i*) Textile Machinery.

(*ii*) Sugar Machinery.

(*iii*) Vegetable Ghee Plants.

(*iv*) Chemical Plants & Machinery.

(*v*) Miscellaneous. This will cover cement, paper, paints, colliery and tea-garden machinery.

Before we proceed to discuss these industries separately it would be worthwhile to make general observations in this regard. Very little of such materials and equipment were manufactured in India before the war. It was only during the war years when plants and equipments of this sort were not available from foreign countries that enterprising Indian industrialists began to get made such plants and equipments from Indian manufacturers. The actual working experience of such equipments manufactured in India proved satisfactory and this branch of the engineering industry got a strong fillip, so much so that different factories took up exclusively this line of production. The industry thus owes its birth to the first year of the war during which period the main function of the industry was replacement of defective and worn-out equipment and spare parts. In the subsequent years of the war the repairs and replacements of these machinery gave an impetus for the manufacture of complete equipment. Moreover the use to which such equipments had to be put during the war which was an over-taxed period, established a certain amount of confidence in Indian made plants and machinery. Before the war it was customary to stop production in a plant for a number of days before the damaged part of the equipment could be replaced by an imported one. This condition has considerably changed because of the establishment of the plant and machinery industry in India.

(i) TEXTILE MACHINERY

Introduction.—Textile industries like cotton, jute, woollen and silk were the first to be started in India and now they have developed on a very large scale with the result that their demand for machinery for extension and replacement has considerably expanded. The following figures of imports of textile machinery would indicate the enormous value which India has to pay in order to procure them from foreign countries:—

Year	Value. (Rupees)
1932-33	2,08,44,507
1933-34	2,03,18,013
1934-35	2,41,17,547
1935-36	2,00,34,889
1936-37	1,80,72,908
1937-38	2,92,12,729
1939-40	1,96,44,882
1940-41	1,36,85,805
1941-42	1,81,06,114
1942-43	1,83,00,247
1943-44	2,40,35,914
1944-45	2,26,95,541
1945-46	2,90,78,062

Lack of sufficient imports of textile machinery during the war has been one of the serious bottle-necks for the textile industry. To make good this deficiency an Indian Company was started in August 1939 under the name and style of the

Textile Machinery Corporation Ltd. with a paid up capital of twenty lacs for the manufacture of cotton textile machinery and parts. It began operation in 1941 with an initial programme of producing 250 spring frames and 2,000 looms annually. It established two factories, one at Gwalior and another at Belghurria, (near Calcutta); the former manufactured textile machinery during the war but the latter was diverted to produce war material.

Present Position.—Their Gwalior branch working with only a small part of their original machinery imported for the purpose is engaged on a programme of manufacturing 1,000 looms per year. The manufacture of spinning frames is still in a preparatory stage. Raw materials and stores for the production of power looms are more or less available in this country. In connection with the manufacture of spring frames they have, however, yet to depend on foreign imports of steel rods, steel tubes and polished tin sheets etc., but the steel industry in India in the post-war reconstruction period will be able to meet most of these requirements. As regards machinery required for the industry mostly consisting of precision machine tools and up-to-date automatic machines of various types, they have almost wholly to depend on foreign imports. The difficulty as regards trained skilled labour will be greatly solved now that the technical staff engaged on war production and military work are demobilised.

The Belghurria factory of the Company has been recently released by the Government and has begun the manufacture of spring frames and looms. The company has recently raised its paid-up capital from Rs. 45 lakhs to Rs. one crore.

The productive capacity of the Company is about 2,000 looms and 10,000 spindles per annum which represents only 20% of the replacement requirement of the existing cotton textile industry. The existing cotton mills in India employ about 10 million spindles and 200,000 looms (pre-war figures).

With the recent announcement of the Government of India for the establishment of new textile mills the demand for textile

machinery is bound to go up. The increase in spindles that has been envisaged by the Government of India is as follows:—

Zone	Provinces and States	Fine Spindles	Coarse Spindles
Bombay surplus Area.	Bombay Presidency ...	114,000	...
	Baroda ...	88,000	...
	Nawanagar ...	...	25,000
	Junagadh ...	...	25,000
	Bhavnagar ...	...	25,000
	Cambay	19,000	...
Sind Zone ...	Sind Province ...	...	75,000
	Khairpur ...	...	25,000
Punjab Zone ...	Punjab Province ...	114,000	323,000
	Delhi Province ...	...	...
	N. W. F. P. ...	...	...
	Bahawalpur ...	...	50,000
	Nabha ...	...	25,000
	Kapurthala ...	...	25,000
United Provinces Zone.	United Provinces ...	114,000	150,000
	Benares State ...	...	25,000
Bihar Zone ...	Bihar Province ...	38,000	175,000
Bengal Zone ...	Bengal Presidency ...	125 000	200,000
	Assam Province ...	100,000	(coarse & fine mixed)
	Seraikala ...	...	25,000
Orissa Zone ...	Orissa Province ...	19,000	100,000
	Mayurbhunj ...	...	25,000
Central Provinces Zone.	Central Provinces ...	76,000	75,000
	Rewa ...	...	25,000
South Zone ...	Madras Presidency ...	152,000	200,000
	Hyderabad ...	19,000	50,000
	Mysore ...	19,000	25,000
	Travancore ...	...	50,000
	Cochin ...	...	25,000
	Pudukottah ...	...	25,000
Rajputana Zone ...	Gwalior ...	19,000	...
	Bharatpur ...	...	25,000
	Bikaner ...	...	25,000
	Dholpur ...	...	25 000
	Alwar ...	...	25,000
	Palanpur ...	19,000	...
TOTAL ...	885,000 fine spindles. 1,873,000 coarse spindles. 100,000 for Assam, coarse and fine together. 2,858,000		

Other Manufactures.—Other manufacturers of textile machinery are India Machinery Co. Ltd., Calcutta and Cooper Engineering Ltd. Satara. There are other firms also which manufacture machinery parts, but the textile Machinery Corporation Ltd. is the first of its kind which has been started for the manufacture of only textile machinery on a large scale.

Conclusion.—One of the long felt difficulties of the textile industry, cotton, jute, silk and woollen is that it has to depend on foreign countries for the fabrication of textile machinery and parts with the result that in times of crisis like war its efficient working and expansion are seriously hindered. The establishment of the Textile Machinery Corporation, therefore, fills an important gap in the industrial economy of the country. It is not necessary, therefore, to stress the immense importance of the enterprise as a necessary adjunct to the great textile industry of the countrv. It is up to the Government to see that everything is done to foster this key infant industry and safeguard it against the onslaughts of competition from powerful firms of international reputation.

(ii) SUGAR MACHINERY

Introduction.—After the textile machinery, sugar machinery ranges first in the list of India's requirements for industrial plant and machinery. Sheltered behind adequate tariff protection, guaranteed for a period of 15 years, the Indian Sugar Industry has made phenomenal progress in spite of the economic blizzard that swept over the whole of the world between 1929 and 1937. Besides the duty, various other special advantages had helped the rapid growth of the industry in the country. As a result, India is now the largest producer of sugar in the world and the capital invested in the industry is over 30 crores of rupees. To-day we have in the country over 150 sugar factories. This development of the industry has led to an enormous demand for sugar mill machinery which can easily be gauged from the following figures of imports of sugar mill machinery into India:—

Years	Rs.
1930-31	13,68,716
1931-32	30,14,449
1932-33	1,53,11,126
1933-34	3,36,38,814
1934-35	1,05,45,439
1935-36	64,37,627
1936-37	95,16,462
1937-38	69,48,733
1938-39	61,36,959

From these figures it would appear that although the demand for sugar mill machinery has been on the increase, Indian engineering industries had not been able to meet the demand for these machineries to any appreciable extent; as a matter of fact engineering industry in this country had not sufficiently developed to specialise in the production of machinery for different industries of the country. It is only during the war period that some progress has been made.

The manufacture of sugar machinery on any large scale began only recently. At present there are a number of factories doing casting work for sugar machinery and others which manufacture sugar machinery parts. There are factories which can manufacture the entire equipment for a sugar mill except a few parts. These firms are: Messrs. Garlick & Co., Ltd., Bombay,

Messrs. Jyoti Ltd., Baroda, Messrs. Hind Tank Manufacturing, Co., Bombay, Messrs. Vasant Industrial & Engineering Works, Bombay and firms like Messrs. Jas. Alexander & Co., Ltd., India Machinery Co., Ltd., Messrs. D. K. Dass & Co., Ltd., in the Calcutta side. In the matter of steel castings firms like Messrs. Bhartia Electric Steel Co., Ltd., have specialised to a high pitch of efficiency. Fuller details will be found in the section under steel castings.

Future Outlook.—The future for the engineering industry manufacturing sugar mill machinery is very bright. In addition to the pre-war demand for sugar mill machinery, the increased demand on account of expansion and replacement is likely to be much. The Government of India have sanctioned the establishment of 20 new sugar factories and for this purpose alone a fairly large quantity of sugar machinery will be needed. It is estimated that machinery worth 4 million pounds or 5·3 crores of rupees would be required and equal quantity of machinery will be needed for the proposed extensions to the existing factories. A large amount of machinery and machine parts will also be needed for renewals and replacements which are over-due now. Thus the total demand of sugar mill machinery is likely to be of the order of 12 crores of rupees.

Indian Engineering Industries Can Do It.*—Regarding the ability of the Indian engineering industries to manufacture sugar machinery the Sugar Panel appointed by the Government of India in their report observe as follows:

"Detailed enquiries have been made by the Institute to ascertain the possibilities for the fabrication of sugar machinery by engineering firms in India. It has been found that there are several such firms possessing equipment suitable for this type of work who would presumably gladly take it up now that the pressure of work in connection with the war is reduced. The Panel accordingly recommends that a central expert organisation attached possibly to the office of Sugar Controller or the Imperial Institute of Sugar Technology, Cawnpore, should be set up for

* **For complete information regarding the scope of manufacture of Sugar Mill Machinery, please refer to "*A Guide to Engineering Industries in India for the Manufacture of Sugar Mill Machinery*" by Mr. K. R. Khosla, published by the Association.**

ascertaining requirements, for classifying and consolidating them, for the programming of their supply, for the preparation and supply of design, and for organising contacts between factory owners and engineering workshops. When this organisation has been set up, priority and other assistance for the import of sugar machinery should be given only in respect of establishment of plants such as power plants, power units, etc., which cannot be manufactured in India without difficulty."

(iii) VEGETABLE GHEE PLANTS

The manufacture of vegetable ghee plants in India is carried on by the following important firms:

1. Messrs. Hind Tank Mfg., Co., Bombay.
2. Messrs. Jyoti Ltd., Baroda.
3. Messrs. Garlick & Co., Bombay.
4. Messrs. Vasant Industrial & Engineering Works, Bombay.

In addition to the above 4 firms there are other factories also engaged in the manufacture of vegetable ghee plants. The industry has supplied complete plants including post and pre-refineries and hydrogenation to a number of firms manufacturing vegetable ghee. The foundry, machine shop and structural shop are fully equipped for the fabrication of these plants. Sufficient manufacturing facilities for the manufacture of these plants are readily available in India.

The Indian industry is able to guarantee earlier deliveries, more efficient working. It would be up to the Indian industrialists to see that this industry developes in the country to its natural extent.

(iv) FINE CHEMICAL PLANTS AND MACHINERY

The manufacture of parts of chemical plants has been carried on in India for some time past. Before the war India was making the following parts for the chemical industry: Rotary Driers, Stills, perelators Acid Pots, Evaporators, Autoclaves, Vacuum Chambers, etc., etc. But for the major part of chemical plants India is entirely dependent on imports. Due to the high standard of purity at which most of the drugs

and fine chemicals are required by regulation, corrosion-resistant eqiupments are to be employed in most of the operations. Much difficulty is encountered in constructing such plants for want of proper and suitable corrosion resistant materials such as stainless steel, monel, inconel, rubber lined stills and vessels etc.

If proper materials could be locally produced or procured from abroad many of the standard equipments are capable of being manfactured locally.

The following are the standard equipments required in the manufacture of drugs and chemicals:

1. Crushers, Ball-mills, Hammer mills, Pulverisers with air separators.
2. Classifiers (screening and separation).
3. Thickners, Clarifiers, Rotary drum filters under vacuum filter presses.
4. Evaporators—Arrangements for using sun-rays, those heated by direct fire (cauldrons, panbaths), those with heating medium in jacket, steam heated evaporators with heating surface in the inside or outside of tubes, plain or under vacuum, single or multiple stage.
5. Centrifuges and Super-centrifuges.
6. Air compressors, centrifugal pumps and other general equipments.
7. Sulphorators, Nitrators and Hydrogenators.
8. Driers:—Spray and drum driers for liquids; Pen, Rotary and Tunnel including tray driers for solids, and vacuum driers.
9. Mixers—gas with gas, gas with liquids, liquid with liquid; liquid with solid, solid with solid; flow mixers, paddle mixers, propeller mixters, and other different varieties.
10. Deodourisers;
11. Crystallisers—Classifying.
12. Rectifiers, heat exchangers.
13. Refrigerators.
14. Dust catchers.

15. Low temperature distillation equipments (R. C. A. Type).
16. High temperature and pressure working equipments such as, valves, gauges, indicators etc.
17. Acid and Corrosion-resistant enamel Ware.
18. Glass, silica and porcelian wares.

The present position is that with the exception of a few of the items all others are imported. On account of non-availability of suitable raw materials and paper market, the manufacture of these appliances and equipments did not attract much attention in the past.

The possibilities of manufacture of these standard equipments will be clear from the following:

(*1*) *Crushers, Ball-mills, Hammer Mills, Pulverisers with air separators.*—These machines are used for reducing the sizes of raw materials. The most important parts are rollers which are usually made of special steel alloys. Messrs. Tata Iron & Steel Co. Ltd. are now manufacturing special steel alloys. Except air separators which are to be used in conjunction with pulverisers, it may not be difficult to manufacture these items.

(*2*) *Classifiers (screening and separation).*—The important raw materials for this item are wire nettings of fine mesh. It is capable of being manufactured in the country.

(*3*) *Thickners, Clarifiers, Rotary drum filters under vacuum filter presses.*—These machines are not very intricate except vacuum pumps and its equipment. As a matter of fact filter presses, and clarifiers are being manufactured in the country by firms like Messrs Garlick & Co. Ltd., Bombay and Jyoti Ltd., Baroda.

(*4*) *Evaporators.*—This item is rather difficult. But they are being manufactured in India. Vacuum pump with its accessories is another component of evaporator which at present is not manufactured in the country. It would therefore, appear that for sometime to come it will have to be imported.

(5) *Centrifuges and Super-centrifuges.*—Important raw materials for centrifuges and supercentrifuges are high tensile steel, corrosion resistant alloys and stainless steel. These steels are now manufactured in the country and with the engineering skill available in the country it is not difficult to manufacture these items.

(6) *Air compressors, centrifugal pumps and other general equipments.*—These are simple items and are being manufactured in the country.

(7) *Sulphorators, Nitrators and Hydrogenators.*—Enamelled wares and corrosion resistant wares play an important part in modern chemical industry. Manufacture of these items depends upon the availability of proper cast iron and enamelled wares.

(8) *Driers.*—Dries are being manufactured at present by some of the Engineering factories. These driers are of three kinds :—

(*i*) Pan rotary and tunnel including tray driers for solids.

(*ii*) Spray and drum driers for liquids.

(*iii*) Vacuum driers.

In addition to their demand in chemical industry they are used by cement industry also. The present production should be enhanced in order to meet the full demand.

(9) *Mixers.*—The manufacture of these items is not difficult but needs study and investigation.

(10) *Deodourisers.*—Designing of Deo-dourisers requires considerable engineering skill and that done its manufacture should not prove difficult.

(11) *Crystallisers-Classifying.*—The manufacture of crystallisers is not a difficult job. The design of this kind of equipment depends upon the climatic condition of the place of operation and the materials used are not difficult to obtain.

(19) *Rectifiers, heat exchangers etc.*—The big engineering workshops of the country are capable of manufacturing these items and efforts should be made to undertake the manufacture of these items.

(*13*) *Refrigerators.*—It is not manufactured in India at present but firms like Messrs. Godrej & Boyce Mfg. Co., Ltd. are planning to undertake the manufacture of refrigerators. Fractional H. P. motors are already being manufactured in the country and they would be available if the manufacture of refrigerators is undertaken.

(*14*) *Dust catcher.*—Dust catcher is not extensively used in India but in future for reasons of health and economy its demand is likely to develop and attention should be paid to develop this industry.

(*15*) *Low temperature distillation equipments.* (*R. C. A. Type*).—These are very modern equipments and it appears India for sometime will have to depend on imports.

(*16*) *High temperature and pressure working equipments such as valves, gauges, indicators etc.*—Some of these items are already manufactured in the country on a small scale. The manufacture of high temperature and pressure working equipments is likely to present some difficulty. Before an attempt is made to manufacture these items in the country on any large scale attempt should be made to develop high pressure research work.

(*17*) *Acid and Corrosion-resistant enamelled wares.*—These are not at present manufactured in India but enamel factories would do well to concentrate their attention on this item.

(*18*) *Glass, silica and porcelain wares.*—The modern fine chemical industry largely depends on glass, porcelain and silica wares. The industry needs immediate development and India is capable of manufacturing these items because the mineral and chemicals required are locally available and there is no dearth of technical skill for the manufacture of these items.

The list of equipments described above excludes some of the common equipments required for the chemical industry such as condensors, centrifugal pumps, extractors and propagators, roasters, and furnaces etc. which are designed and fabricated locally according to need. Firms like Jyoti Ltd., Baroda

Messrs. Garlick & Co. Ltd., Messrs. D. K. Dass & Co., Calcutta are already manufacturing these items.

The development of chemical engineering in a planned economy is very necessary in order to help the fine chemical industry of the country. For the success of the chemical industry, it is necessary that some engineering firms specialise in the manufacture of equipment required by the chemical industry.

(v) MISCELLANEOUS—CEMENT, PAPER—MACHINERY ETC.

There is no planned production of machinery required by Cement, Paper and Paint factories. The engineering firms in the country have in the past manufactured machinery parts according to the requirements of individual parties. There are engineering firms manufacturing certain parts of machinery required by these industries e.g. Messrs. Jyoti Ltd., Baroda Manufacture Paper Cutting Machines, India Machinery Co., Ltd., Calcutta manufacture small printing machines, Messrs. Howrah Trading Co., Ltd. and Messrs. Jas Alexander Co., Ltd., Calcutta are undertaking the manufacture of colliery and tea garden machinery; Messrs. Garlick & Co. Ltd., Bombay manufacture the following parts of Paper Machinery :—

(*i*) Straw cutters.

(*ii*) Stationery digestor.

(*iii*) Revolving digestor.

(*iv*) Lime mixer.

(*v*) Conveyor.

(*vi*) Vats for board machines.

Conclusion.—In the foregoing pages we have described how India is endeavouring to manufacture the important items pertaining to industrial plant and machinery. This industry which got encouragement during the war made an important contribution and it is necessary that it should be developed in order to make India self-sufficient. The advantages which would be obtained by the growth of such industries could be summarised as under:

(1) The crores of rupees that are sent out of India for the purchase of these equipments will remain in the country.

(2) The development of these industries would offer employment to thousands of technical labourers.

(3) Our foreign balances can be more wisely spent in buying only such equipments which are really impossible to make in the country at present because of lack of skilled workmen, research, and pilot plant facilities etc.

(4) The development of other industries would be accelerated when these equipments could be manufactured in the country itself. The foreign manufacturers are giving very late deliveries and demanding exorbitant prices. If the plants and equipments required by other industries can be developed in India, such dependence on foreign countries would be a thing of the past.

In order to develop these industries to a stage of self-sufficiency, it will be necessary to establish a chain of industries and also to instal additional equipment and machinery in existing factories to enable them to expand their production. In order to make it a success Government help is called for in the following directions:—

(1) Raw materials required by the industry should be supplied in sufficient quantities.

(2) The industry should be declared a protected industry and equipments which can be manufactured in the country should not be allowed to be imported.

(3) Government help is necessary in the matter of research.

It must be recognised that the industrial plant and machinery industry is the parent industry and the backbone of the industrial structure of any country. In the interest of the nation the development of the industry is urgent and imperative. The success of planning schemes will greatly depend upon the capacity of India to produce her own equipment.

2—DIESEL OIL ENGINES

Introduction.—The pioneering efforts in the field of diesel oil engines have been made by Messrs. Cooper Engineering Ltd., Satara. This firm was started in the year 1922. In 1932 the manufacture of internal combustion engine was introduced with a range of solid injection type diesel oil engines in sizes from 7 B.H.P. to 20 B.H.P. These engines were of the modern cold starting four cycle design and were very soon in great demand for irrigation work, electric light generation and other industrial purposes. Another firm before the war was that of Messrs. Kirloskar Brothers Ltd., who manufactured vertical single and twin cylinder engines.

War-time development.—During the war the manufacture of oil engines had to be stopped by Messrs. Kirloskar Brothers Ltd., because the importation of most of the essential components of their engines had stopped. Messrs. Cooper Engineering Ltd., howver, expanded their production greatly. During the war they introduced one new high speed horizontal type of engine. Their range of industrial engines includes, cylinder, horizontal, cold starting, solid injection, four cycle types from 7 B.H.P. onwards, twin cylinder type from 100 to 120 B.H.P. and four cylinder type from 200 to 256 B.H.P. together with the recently introduced design of 10 B.H.P. high speed engine operating at 1000 R.P.M.

Conclusion.—Messrs. Kirloskar Brothers Ltd., have recently floated a public limited company for the manufacture of oil engines. The oil engine factory is being established at Poona. Their programme of manufacture includes from 5 B.H.P. to 300 B.H.P. to start with. The manufacture in their new plant would start in about a year's time. To day Messrs. Cooper Engineering possess some of the finest types of machines which are used for the manufacture of the latest range of diesel oil engines without having the necessity of importing parts with the exception of fuel oil injectors and fuel pumps for certain sizes of engines. All the engines manufactured by them are subjected to an exhaustive test before leaving their works. They have supplied engines of thousands of B.H.P. in aggregate for India's requirements. Their present productive capa-

city of these engines of various sizes is nearly a thousand per annum.

In view of the present schemes of development the industry has a bright future before it.

3—ROAD MAKING MACHINERY

Bitumen Boilers and Mixers.—The chief items under road making machinery are Bitumen boilers and mixers. Bitumen boilers are vessels for heating Bitumen (Road Tar) prior to pouring on road surfaces. The boiler together with a set of paddles inside to be turned by means of a handle is known as Bitumen mixer.

Before the war, the Structural Engineering Works Limited, Bombay and Messrs. Burn & Company, Calcutta, were manufacturing these items. The total production came to about 100 units. During the war the demand for these articles went up for aerodromes and roads, with the result that more firms have come into the field the important ones of which are Messrs. Jas. Alexander & Company Ltd., Calcutta and Messrs. B. R. Herman & Mohatta Limited, Karachi.

Present Position.—The present production of these units comes to about 1,000 pieces per annum. A design of Bitumen boilers and mixers has now been standardized and the prices reduced.

Asphalt mixers and concrete mixers.—These are revolving drums driven by power used for mixing cement or asphalt with stone chips. Before the war, these were imported but attempts were made to manufacture these by a firm in Bombay during the war. The present production capacity of India in this line is about 60 units per annum.

Extensive machinery is required in the manufacture of these mixers and the processes of manufacture are also complicated. The main raw materials for the industry are steel and cast Iron which are locally available. Some of the components have got to be imported.

Diesel Engine Road Rollers.—In addition to the above two items in road making machinery Diesel Engine Road Rollers are also manufactured now in India by Messrs. Cooper Engineering Ltd., Bombay. The model on which manufacture is at present being concentrated is a 6/8 ton machine being diesel driven and designed with a 3 speed and reverse gear box. The power unit is a Horizontal, Single Cylinder, four cycle,

Cold Starting Cooper Diesel Oil Engine, designed specially for road roller propulsion. It is of extremely simple design, very robust in construction, and developes the correct power in ratio to the weight and duty of the road roller. The complete road roller incorporates all special features similar to those on imported machines. Meehanite Metal High duty castings are used throughout in place of ordinary grey iron castings and high quality steels are incorporated where considered essential. Extra fittings such as water syrayers, pump and hose connections, winding gear, power pulleys, scarifiers etc., can be supplied if desired. Designs are also proceeding for a 10/12 ton size machine.

Conclusion.—With the vast schemes of Central and Provincial Governments for road development, road making machinery industry has a bright future. It is necessary that more engineering firms should take to this line of manufacture in order to make India self-sufficient.

4—WEIGHING MACHINES AND JACKS

The manufacture of weighing machines in India was started much before the war and two of the important units that were engaged in this line of manufacture are the Star Iron Works, Lillooah and the India Machinery Company Ltd., Calcutta. The growth and development of sugar industry and later on the war of 1939 gave a strong fillip to the Industry and the productive capacity of the firms expanded greatly. The increased production was achieved by the old firms due to their greater concentration on this item. The important firms now engaged in the manufacture of weighing machines are the following:—

(1) Messrs. India Machinery Co., Ltd., Calcutta.

(2) Messrs. Star Iron Works, Lillooah.

(3) Messrs. Avery & Co., Calcutta.

(4) Messrs. Bharat Weighing Scales and Engineering Syndicate, Calcutta.

(5) Messrs. Auto Scales Manufacturing Co., Calcutta.

There is a vast field for the weighing machine industry in India in the manufacture of new types.

In addition to weighing machines, jacks are also manufactured. In 1943 India produced some 15,000 Jacks but there exists a capacity for over 75,000 units per annum.

5—WATER FITTINGS

Before the war there was no organised production of water fittings of standardised designs. India had to depend largely upon imports for her requirements. But during the war the manufacture of these articles was encouraged by the Government by placing large orders with them and supplying raw materials at the controlled rate.

The raw materials required for the manufacture of water fittings are: brass, copper, gun-metal ingots, scrap and zinc. The brass or gun-metal ingots form the basic raw material. These are melted in small crucible furnaces and the molten parts are then treated on lathes and various other operations of screwing, threading and cutting and gleaning etc., are performed. Then the parts are fitted, chilled and buff polished.

The industry has made considerable progress during the war years. The Indian production of water fittings like bib cocks, globe valve etc., are produced in sufficient quantities and good quality.

6—CENTRIFUGAL AND HAND PUMPS

This industry existed in India before the war and the three important firms engaged in the manufacture of centrifugal and hand pumps were Messrs. Kirloskar Brothers Ltd., Kirloskarvadi, Messrs. Jyoti Ltd., Baroda, Messrs. P. S. G. & Sons, Coimbatore and Maya Engineering Works, Calcutta. As a result of the impetus given by the war several other small firms came into the field to meet the civilian demand because the manufacture of these old established firms went to meet the demand of the Government. During the war the production of centrifugal pumps received a set back on account of non-availability of ball and roller bearings but it has now gained momentum again because the war-time difficulties do not exist.

Hand operated pumps are also manufactured in India by a large number of firms. In the case of hand pumps India's production is quite sufficient to meet the demand.

The three major firms manufacturing centrifugal pumps may now increase their production to meet the increased demand of the country.

SECTION VI

ELECTRICAL ENGINEERING INDUSTRIES

The development of electric power is a great desideratum for the development of India's industries. It is a cheap motive power for industries. In addition, electricity is essential for raising the standard of life of the people. Development of electricity makes up the shortage of coal and oil fuels. Electricity will be also required for transport purposes specially for the electrification of railways in order to conserving metallurgical quality of coking coal and in the extended use of tram-cars consumption of electricity would increase greatly. The use of electricity for lighting, heating and air-conditioning is daily increasing. India possesses natural resources for generation of hydro-electric power. The potential reserves are estimated at about 27 million kilowatts of which about half a million kilowatts only have been harnessed so far.

With the greater consumption of electricity the development of electrical engineering industries will greatly increase.

Pre-war position.—Before the war of 1939 these important electrical industries namely electric wires and cables, electric fans and electric lamps had got definitely established. But the production could meet only a part of the demand and for the rest India had to depend upon imports. In the field of electric lighting accessories, electric wires and cables, electric motors etc., India had made a small beginning. The imports of electrical engineering products chiefly came from the U. K., Germany, Netherlands, Italy and France. The share of the U. S. A. in this import trade was small.

War-time Development.—The war of 1939 presented a tremendous opportunity for the development of existing electrical engineering industries and the establishment of new ones. The industries that greatly expanded their production were, electric fans, electric lamps, electric motors, electric wires and cables, secondary batteries, dry batteries and cells, distribution transformers and electric lighting accessories. In the field of electric fans, motors, wires and cables, new companies were started in addition to the existing ones. The most important



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electrical industries that were newly started during the period of the war are electric motors, conduit pipes, black adhesive tapes and D class signalling cables.

From the figures of production given in the following pages it will appear that the production expanded considerably during the period of the war. It must, however, be understood that some of the important raw materials for these industries are imported. Therefore, the development was handicapped by the non-availability of these important raw materials to the desired extent. One of the remarkable developments of the period of war has been connected with the beginning that has been made for the manufacture of some of the raw materials in the country itself. For instance Messrs. Tata Iron & Steel Co., Ltd., undertook the manufacture of tool steel and electrical steel sheets on a sizeable scale. Their present production of these sheets is about 1,800 tons per annum and is meeting a part of India's demand for these sheets. Similarly, in the case of incandescent lamps two important components namely, Glass Shells and Brass Caps are now manufactured in the country itself. In addition, a company has been started for the manufacture of ball bearings in the country. Although actual production has not yet begun, the beginning is welcome to the electrical industries. All these changes that have taken place during the last three or four years have helped in making the electrical industries independent of foreign imports to the extent of the Indian manufacture. In the following pages we shall survey the progress made in the field of some of the important electrical engineering industries.

1—ELECTRIC FANS

Introduction.—The Electric Fan Industry in India was started in 1924 by the India Electric Works Ltd., which was started in the year 1921 under the name and style of Scientific and Electrical Instruments Mfg., Co. This was the first fan factory on modern lines established in India. This company had to face a lot of difficulties both from the public and the Government but confident in its efficiency and workmanship the company faced the difficulties bravely. It would be interesting to trace the early growth of the industry in the country. In 1924 the company came in contact with one Mr. N. C. Bhattacharya, an eminent Engineer who had designed a novel and wonderful fan which consumed only 40 per cent of electric current consumed by the best of the imported fans of those days. The company took up the patent rights on royalty basis and the foundation of Electric Fan Industry was laid.

Later Developments.—The success achieved by this pioneering company prompted other industrialists to come into the field and before the war of 1939 half a dozen factories had been established. Some of the important units that engaged themselves in the manufacture of electric fans after the signs of depression had begun disappearing were as follows:—

1. Calcutta Electrical Mfg., Co., Ltd., Calcutta.
2. Electrical Fan & Motor Mfg., Co., Ltd., Lahore.
3. Messrs. Crompton Parkinson (Works) Ltd., Bombay.
4. Everest Engineering Co., Ltd., Calcutta.
5. British India Construction Co., Ltd., Calcutta.
6. The Model Industries, Dayalbagh.
7. Messrs. O. K. Electric Works Ltd., Lahore.

Of all these firms the India Electric Works was and still remains by far the biggest producer of electric fans in India.

The pre-war production of electric fans in India came to about 30,000 ceiling fans and 5,000 table fans. The table fans were produced only by the India Electric Works.

War-Time Development.—When the war broke out, greater demand for electric fans ensued and the position was

accentuated by the shortage of imports. How the imports fell off will be indicated from the following figures of imports:

(Imports before the war)

	Rs.
1936-37	35,15,896
1937-38	31,07,142
1938-39	25,09,550

Before the war, it would thus be seen that the imports of fans on an average amounted to about 30 lakhs of rupees per annum. From the following figures of imports during the war period it would appear that the imports fell off heavily and in 1940-41 they came to only Rs. 14 lakhs:

	Rs.
1939-40	18,70,312
1940-41	14,27,414
1941-42	11,65,985
1942-43	10,52,987
1943-44	7,69,085
1944-45	1,92,973

This shrinkage of imports coupled with greater demand for the military and other Government Departments gave a strong fillip to the development of the indigenous industry. The production of electric fans during the war period expanded immensely as would be evidenced from the following figures:

	Ceiling Fans	Table Fans.
1940	38,000	6,800
1941	47,800	9,600
1942	38,400	11,000
1943	41,200	10,000
1944	1,05,000	30,000

The fall in production in the year 1942-43 is accounted for due to the lack of imported raw materials.

This increased production was obtained due to the expansion in production by the old concerns and the establishment of new ones. Of the important factories that were started during the war, mention must be made of the second factory which the India Electric Works Ltd., established at Behala in the suburbs of Calcutta. At the same time many new companies came into the field some of which have since grown into sizeable industrial units. The important ones are the following:—

1. Messrs. Kaycee Industries Ltd., Lahore.
2. Messrs. G. T. R. Co., Ltd., Calcutta.
3. Messrs. Raghu Engineering Works Ltd., Delhi.
4. Messrs. Metropole Works, Amritsar.
5. Engineering Works of India Ltd., Calcutta.
6. Clyde Fan Co., Ltd., Calcutta.
7. General Electric Co., (India) Ltd., Calcutta.

The machinery installed in the big factories are mostly imported. The India Electric Works Ltd., obtained the machinery for its factory at Behala from countries like the U. S. A., the U. K., and China.

Present position.—It is estimated that India, at present, produces about 1,40,000 ceiling fans per annum. The capacity for table fans is of the order of 50,000 fans per annum. The country manufactures all types of ceiling and table fans, special types of fans like pedestal, exhaust, railway carriage fans and cabin type fans used in the ships. The industry can fully meet the requirements of the country in regard to ceiling fans. For table fans the capacity will have to be increased in the coming years.

Raw Materials.—Most of the important imported raw materials for the fan industry are the following:—

(1) Electrical steel sheets.
(2) Winding Wires of various types and sizes.
(3) Ball Bearings.
(4) Insulating Materials.
(5) Pipes.

Electrical Steel Sheets.—The country is now not entirely dependant upon imports for electrical sheets. As we have pointed out, Messrs. Tata Iron & Steel Co., Ltd., have started the manufacture of these sheets and their present production is 1,800 tons per annum. They are going to erect one additional furnace in order to double their production. The present requirements of the fan industry for electrical sheets comes to about 5,000 tons per annum. It would, therefore, appear that for the balance the fan industry will have to depend upon imports for some time to come.

Winding Wires.—Enamelled and silk covered copper wires are required in the fan industry for winding and maintenance purpose. Although Indian Cable Co., Ltd., manufactured a few sizes of such cotton covered wire. The country had in the past to depend mainly upon imports. Recently an attempt has been made by the National Insulated Cable Co., of India Ltd., Calcutta, to manufacture enamelled wire here. They have installed two plants for the purpose and their present capacity is about 200 tons per annum. They have already manufactured sample quality and after the necessary tests they are expected to switch on to commercial production. The new company is manufacturing single cotton covered wires also.

Ball Bearings.—For the manufacture of good fans, ball bearings are very necessary. India has been completely dependant on foreign sources for these ball bearings. An attempt has been made already to manufacture ball bearings in the country itself.

Insulating Materials.—The important insulating materials are empire cloth, leatheroids, tape, tubings, ebonite rod etc. Recently attempts have been made to manufacture tapes and empire cloths, etc., locally. India has to import almost all the insulating materials at present.

Pipes.—Galvanised steel pipes are used for down rods and have got to be imported.

Difficulties.—The present difficulties with regard to the fan industry relate to shortage of raw materials both that are

imported and are locally available, of winding wires, electrical steel, insulating materials etc., and pipes. But the difficulties are temporary and in course of time must disappear.

Manufacture of quality fans.—Since the manufacture of fans does not require machineries of a specialised kind, during the war there has been a mushroom growth of small firms who so far did assembling of parts. There is a definite danger to the industry if this mushroom growth for the manufacture of unstandardised fans is allowed to continue. In the interest of the Industry, therefore, the reliable manufacturers have formed themselves into an Association under the name and style of the Fan Makers Association of India. One of the most important objects of which is to formulate specifications and insist that the fans manufactured would conform to those specifications.

Conclusion.—From the above it would appear that the Indian industry has now reached a stage of development where India can be self-sufficient in the matter of electric fans. In view of various hydro-electric development schemes the demand for electric fans is bound to rise and the industry has a very bright future before it. The present need is that the manufacture should be of standard quality. Within a period of 25 years the industry has achieved phenomenal progress unaided by Government. In order to sustain this development it is necessary that in an era of planned economy the industry is not allowed to starve of imported raw materials.

2—THE ELECTRIC LAMP INDUSTRY

Introduction.—Our discussion in this section is limited to incandescent electric lamps which are used for general lighting purposes. The heading excludes electric lamps required for torches, automobiles, projectors, etc. The industry was started in India in the earlies of the depression period when the Bengal Electric Lamp Works Ltd., was started to undertake the manufacture of these lamps. Before the war India was consuming nearly fourteen million bulbs of which about eleven millions were imported. The share of different countries in the case of gas filled electric bulbs was as follows:—

United Kingdom	50%
Netherlands	20%
Japan	15%
Other countries	15%

In the case of vacuum electric lamps Japan used to export to India about 70% of the requirement and the rest came from Europe and America. The Japanese lamp on account of their cheapness were very popular in the Indian market. Before the war only the Bengal Electric Lamp Works was a firm of any consequence. Their production before the war was as follows:—

1937-38	6,32,000 Pieces
1938-39	7,43,000 „
1939-40	9,59,000 „

The import of lamps before the war both vaccum and gas filled has been of the following order:—

Year	No.	Value (Rs.)
1935-36	2,48,87,302	39,87,676
1936-37	2,29,47,991	33,02,306
1937-38	2,73,83,011	39,76,046
1938-39	1,89,45,228	28,01,396

From the above figures it would appear that the demand of India for electric lamp came to about Rs. 35 lakhs.

War-time Development.—When the war broke out the imports of lamp began to fall heavily and especially so when Japan entered the war the imports from that country were stopped. On the other hand the demand from factories, offices, mills, and offices, Government and Military went on increasing. How the imports fell off will be evident from the following figures:

Year	No.	Value (Rs.)
1940-41	1,97,95,779	21,57,146
1941-42	2,56,83,624	26,09,391
1942-43	42,40,649	18,77,722
1943-44	26,70,536	15,16,742

This diminishing import and increasing demand led to a great expansion of production in Indian factories. Some of the small existing factories carried out additions to their factories in order to augment their production whereas in case of bigger units the production was raised to the maximum according to the capacity of their plant and personnel.

How India's production increased will be evident from the following figures of production:

Pre-war.	$2\frac{3}{4}$	millions.
1942	$3\frac{3}{4}$	,,
1943	$3\frac{3}{4}$	,,
1944	5	,,

In addition to the existing factories, during the pendency of war some new factories were established the important ones of which are Kaycee Industries Ltd. with their factory at Shikohabad and Radio Lamp Works Ltd. Karachi. Now both the factories belong to Radio Lamp Works Ltd.

Present Position.—There are at present twelve lamp factories in India which are as follows:—

(1) Electric Lamp Manufacturers of India Ltd., Calcutta.

(2) Bengal Electric Lamp Works Ltd., Calcutta.

(3) Radio Lamp Works Ltd., Karachi.

(4) Mysore Lamp Works Ltd., Bangalore.
(5) Kaycee Industries Ltd., Shikohabad.
(6) Lux Lamps Ltd., Calcutta.
(7) Bharat Electrical Bulb Works Ltd., Calcutta.
(8) Calcutta Electrical Lamp Works Ltd., Calcutta.
(9) Asia Electrical Lamp Works Ltd., Calcutta.
(10) Bijlee Products Ltd., Bombay.
(11) Pradip Lamp Works, Patna.
(12) Bharat Electrical Industries Ltd.

One large factory in Hyderabad sponsored by that State and one more in Madras town are going to be started and expected to begin production within the next two years.

The first of these namely Electric Lamp Manufactures of India Ltd., which are popularly known as 'ELMI' Group, manufacture lamps, and brand them according to the requirements of their various partner firms who are leading European firms in India trading in lamps. The names of these partner firms together with the brands under which their lamps sell are given in the following table:—

No.	Names	Brands
1	Association Electrical Industries (India) Ltd.	Mazda
2	General Electric Company (India) Ltd.	Osram
3	Philips Electrical Company (India) Ltd.	Philips
4	F. & C. Osler Ltd.	Cosmos
5	Greaves Cotton and Crompton Parkinson Ltd.	Crompton
6	Balmer Lawrie & Co. Ltd.	Ediswan
7	Siemens (India) Ltd.	Siemens

This foreign combination was formed to start a factory here in India as they began to feel the inroad of Indian lamps in this exclusive market they solely enjoyed as the

reputation of Indian Lamp Factories began to get established. Now it is a matter of great concern how much of the internal market can be kept open to an entirely foreign combine who were permitted to establish the factory here.

Of the 12 factories mentioned above Messrs. Kaycee Industries Ltd. and Lux Lamp. Works Ltd. Calcutta were established during the war. Pradip Lamp Works, Patna were started about a year back after the end of the war.

War-Time Control.—In order to ensure supplies to meet Government requirements, the Government of India, during the war, were exercising perfect control over the production and distribution of electric lamps. The Control was also necessitated on account of short supply of raw materials which had to be rationed out according to the capacity of each firm. The control was exercised through the D. G. M. P. in the following manner:

(*i*) The manufacture of lamps had to be carried on according to the directions of the D. G. M. P. with regard to size, wattage and voltage, and quantity.

(*ii*) complete statement of the estimated production during the next month and of despatches during the previous month of electric lamps was to be submitted to the D. G. M. P. by the 20th of every month and

(*iii*) a written permit from the D. G. M. P. was necessary for selling or consuming any lamp.

The effect of this control was that the raw materials were distributed evenly which helped production a great deal. Of course all this was done to meet the war demand. One of the clearest lessons of the war is that the direct assistance of the Government can go a long way towards the development of Indian Industries.

Location.—The present distribution of the lamp industry would indicate that the industry is highly located in Calcutta. Out of the 12 factories seven are located in Calcutta and one each at Shikohabad (U. P.), Karachi, Bombay, Mysore and Patna. The industry developed in Mysore because of the direct

encouragement of the State Government. Shikohabad industry has got established in order to be in close proximity of the manufacture of glass shells which are apt to break if transported. The location of the factory in Bombay is accounted for owing to its nearness to England from where some of the important components are imported. The Patna factory has got the advantage of being at a central place and thus affords the facility for marketing the lamps manufactured. The location at Karachi was favoured perhaps because of its nearness to the western countries and the availability of markets. An explanation is necessary for the greater concenteration of the lamp industry in Calcutta. Calcutta and its surrounding area have been favoured due to the presence of scientific research laboratories, existence of a glass industry, availability of cheap electricity and gas, proximity of market and supply of skilled labour. In the future industrial planning of India, it would thus be seen from the above analysis of industrial location that centres like Cawnpore, Lahore and Delhi would attract the industry.

Raw Materials.—The important raw materials required by the lamp industry are glass shells, Lead-in-wire, Molybdenum wire, Tungsten filament, brass caps, and gases like Nitrogen and argon. The quality of Indian glass shells before the war was not satisfactory though some firms were using them. Before the war brass caps were imported from Japan, Germany and the U. K. Now glass shells are being manufactured in India, at Shikohabad and at Calcutta. The first plant for shells was put up by the Bengal Lamp Works. Now they are manufactured at Shikohabad by Kaycees and at Bombay by the Elmi group. Lead-in-wire and Molybdenum wire and Tungsten filament were imported from the U. S. A., Holland, Japan, Germany and the U. K. Similarly the Nitrogen and Argon gases were also imported. This position still continues to exist.

In addition to the factory at Shikohabad, there are other small firms in and around Calcutta manufacturing glass shells.

At present the lamp industry is facing difficulties in obtaining materials from the U. K. which is the only available source

of supply because of difficulty in obtaining dollars. The deliveries given by U. K. suppliers are unduly long and their prices are higher than those of the American suppliers. The following table which gives the U. K. and the U. S. A. prices of glass shells, tungsten wire and Molybdenum wire will indicate the difference in the prices of the two countries:—

Name of the article.	Sizes.	U. S. A. rate per 1000 pcs. f. o. b. New York in Shilling.	U. K. rates per 1000 pcs. f. o. b. British Port in Shilling.
Glass Shell	55 mm clear...35/-	($-7·0)	63/-
	60 mm „ ...34/-	($-6·90)	65/-
	65 mm „ ...40/-	($-8·10)	67/-
	70 mm „ ...45/6	($-9·20)	79/-
	75 mm „ ...54/6	($-11·0)	84/-
Tungsten Wire.	0·61-0·75 mgrs	29-7d ($ 5·95)	38/-
	0·76-1·00 „	25-3d ($ 5·10)	43/-
	1·01-1·25 „	21-0d ($ 4·25)	
	1·26-1·75 „	18-11d($ 3·80)	
	1·76-2·25 „	17-8d ($ 3·55)	
	2·26-3·50 „	16-5d ($ 3·30)	49/6
	3·51-5·00 „	20-0d ($ 4·05)	
	5·01-7·90 „	23-2d ($ 4·75)	
	7·91-11·40 „	27-5d ($ 5·50)	55/6
	11·41-15·45 „	34-3d ($ 6·90)	66/-
	15·46-20·10 „	41-0d ($ 8·25)	80/6
	20·11-25·40 „	49-9d ($ 10·00)	109/6
Molybdenum Wire.	0·12 mm dia.	28-0d ($ 5·62)	63/-
	0·15 mm dia.	35-2d ($ 7·08)	84/-
	0· 2 mm dia.	54-3d ($ 10·93)	116/6

In order to enable the Indian industry to get raw materials at cheaper rates the Government of India have removed the import duty on raw materials and it would be in the fitness of things and in keeping with the Government policy to encourage the development of this important industry to make dollars freely available in order to enable the Indian industry to effect purchases from the American market.

Conclusion.—Although the lamp industry in India is only a decade old, it has made rapid progress and has reached a stage where it has made the country self-sufficient in the matter of electric lamps. The industry calls for highly skilled labour and it must be said to the credit of the industry that it has trained a band of workers who are efficient at their work. In the present transitional stage Government help is called for in the matter of making available the imported raw materials.

It is gratifying to note that the Indian Lamp Factories Asssociation is putting their concerted effort to produce all raw material, necessary for lamp industry, in this country and make the Industry completely independent of any foreign import.

3—ELECTRIC MOTORS

Introduction.—Electric Motor Industry in India existed before the war. The two most important factories that were engaged in its manufacture were Messrs. P. S. G. & Sons Charity Industrial Institute, Coimbatore, and Messrs. Kirloskar Brothers Ltd., Kirloskarvadi. Although these two firms were manufacturing motors before the war the industry developed only during the war. The two firms mentioned above had produced some electric motors which were found satisfactory and they were about to embark on production on a large scale when the war broke out. The annual output of Messrs. P. S. G. & Sons came to about 200 motors per annum. Before the war the imports of motors in the country were as follows:—

	Rs.
1936-37	35,25,302
1937-38	46,93,381
1938-39	63,12,027

When the war broke out the imports dwindled as would be evidenced from the following figures of imports:—

	Rs.
1939-40	41,71,301
1940-41	32,90,111
1941-42	53,29,515
1942-43	43,96,865
1943-44	42,23,342

On account of the difficulties in the imports it became necessary for the Government to increase production in India in order to meet the war demand. The imports of motors from the United Kingdom particularly declined due to increased home consumption and sinking of ships by enemy action. The Government of India encouraged the Indian firms to step up their production and gave encouragement to new firms to manufacture electric motors. The new firms that came into being are as follows:—

1. The Associated Electrical Industries (India) Ltd. Calcutta.

2. Messrs. Crompton Parkinson (Works) Ltd., Bombay.
3. Messrs. Kirloskar Brothers Ltd., Kirloskarvadi.
4. The British India Electrical Construction Co., Ltd., Calcutta.
5. Messrs. Metropole Works, Verka, Amritsar.

Thus we find that the development of the industry was accelerated as a direct result of the war conditions.

Later Development.—In addition to these firms, finding the scope for development, Messrs. Kayce Industries Ltd., of Lahore, also established a plant for the manufacture of electric motors about a year back. Similarly, Messrs. India Electric Works Ltd., of Calcutta have begun the manufacture of motors on an experimental scale recently. Messrs. Kirloskar Brothers Ltd., have floated a separate company for the exclusive manufacture of electrical machinery. In addition to the above firms the following companies have also come into the field:—

1. Messrs. Argus Engineering Co., Ltd., Bombay.
2. The Eastern Electrical Co., Ltd., Coimbatore.
3. Messrs. Jyoti Ltd., Baroda.

Production.—India at present manufactures squirrel cage 3 phase electric motors ranging between 1 to 30 H. P. The present productive capacity is about 20,000 motors per annum. Some of the bigger units of the industry like Messrs. Kirloskar Brothers Ltd., are planning to manufacture motors up to 300 H. P.

As against this capacity for production India's demand for these types of motors comes to about 30,000.

Industrial location.—The industry at present is situated in Calcutta, Bombay, Punjab and South India. From the point of view of location factors the industry is situated at suitable centres. From the point of view of labour, Calcutta and Bombay factories are better situated because they are in the midst of such regions where trained labour is found in abundant supply. Other factories have also got trained personnel. In addition to labour supply the raw materials except some of them are available locally. The industry is adequately

financed and run by businessmen, some of whom are technical experts and have experience of managing engineering industries for a long time.

Raw materials.—The important raw materials required for the manufacture of electric motors are copper ingots, copper strips, DCC copper wire, electrical steel sheets, ball bearings, welding rods, leatheroid, pig iron, steel bars, empire cloth, black adhesive tape, VIR wires etc. Excepting copper insulating materials and ball bearings, all the materials are locally available. The manufacture of electrical sheets has now begun in the country. But the industry will have to depend on imports for a portion of its demand.

Conclusion.—Power is the life blood of modern industry and as such the development of electric motor industry should be regarded as of national importance. With the completion of hydro-electric schemes and of thermal plants the demand of electric motors is bound to rise. The demand for motors will go on increasing in the coming years along with the development of power and other industries. The Indian electric motor industry has stood the nation in good stead during an emergency period like the war and has shown its ability to develop on scientific lines. In a country like India where agriculture which is the mainstay of India's teeming millions has not developed the use of tractors and power-driven plants and where agricultural industries are going to be planned on a large scale and the development of electric power is well in hand, the development of an Electric Motor Industry is a very important matter. The growth of many new industries and the development of the existing ones will make increasing demand on India's motor industry which warrants its development at a faster rate than has been the case so far.

4—ELECTRIC WIRES AND CABLES

Introduction.—The Electric Wires & Cables Industry was started in India much before the war by the Indian Cable Co., a British concern in origin. But its production was small and major portion of India's demand for wires and cables was met by imports. The following figures of pre-war imports would indicate the demand for wires and cables for the country:—

	Rs.
1934-35	30,79,618
1935-36	29,15,882
1936-37	31,97,682
1937-38	42,37,908
1938-39	1,32,00,000

From the above figures it would appear that in 1938-39 the value of imports came to about Rs. 132 lakhs. The Indian Cable Co., used to produce only the ordinary trade types of wires like bare copper wire, cotton covered wire and various types of VIR cables.

War-Time Development.—When the war broke out the imports fell off and the Government of India was faced with the problem of enhancing the local production. Besides, special kind of cables required by the army had to be manufactured. With this end in view Government set up a factory at Tatanagar for manufacturing 'D' class signalling cables solely required by the army. The Indian Cable Co., could not be made to produce this class of cables without curtailing its production of ordinary types which were also in great demand. The Government factory was established at a cost of half a million pounds. Another important development in the field of cable industry was the establishment of a new factory, namely, the National Insulated Cable Co., of India Ltd., who established a factory in C. P. during the period of the war.

Later Developments.—After the cessation of hostilities the Government cable factory had stopped the manufacture of 'D' class signalling cables. It has been switched on for the

manufacture of ordinary types of cables required by the trade. It is understood that the Indian Cable Co., are going to take over this concern and re-start it on full production of commercial types of wires and cables. The National Insulated Cable Co., of India Ltd., have closed down their factory in C. P. and have established it near Calcutta at Shamnagar on the B. A. Rly.

Present Position.--The Indian cable industry at present is manufacturing bare copper wire, cotton covered wire, enamelled wire and VIR cables. The Indian production now is much higher than what it was before the war. In 1943 production of VIR cables was about 20½ million yards of which 98 per cent. went to Government use. The production of winding wires and bare copper wires in the same year amounted to 190 tons and 7,500 tons respectively.

A survey of the new unit of the industry, namely, the National Insulated Cable Co., of India Ltd., is necessary in order to grasp the present size of India's cable and wire industry. As pointed out earlier this company has established its factory at Shamnagar near Calcutta.

The company possesses a most modern and up-to-date plant. They are equipped to produce the following types of wires and cables and are in continuous production of the same:

(*i*) Hard drawn electrolytic bare copper wires—solid and stranded—for overhead lines, of sizes listed in B. S. S. 125.

(*ii*) Soft annealed electrolytic copper wires all sizes for winding as well as *Zari* purposes.

(*iii*) Annealed tinned copper wires—of popular sizes for winding purposes and fuse wires.

Their production capacity at present is:—

Bare copper wires—12,000 tons per annum.

Aluminium cable steel re-inforced—5,000 tons per annum.

VIR cables—50 million yards per annum.

Cotton covered wires—150 tons per annum.

Enamelled copper wires—200 tons per annum.

Taking into consideration the production of the Indian Cable Co., the total production capacity of the industry as a whole would come to the following:—

Bare copper wires—22,000 tons per annum.

VIR cables—65 million yards.

Cotton covered wires—300 tons per annum.

Enamelled copper wires—400 tons per annum.

It must be noted that the production of enamelled copper wire has begun only on an experimental scale and the only Company manufacturing it, namely, the National Insulated Cable Co., of India Ltd., would launch on commercial production very soon.

Raw Materials.—The chief raw materials for the manufacture of electric cables and wires are:—

1. Lead,
2. Copper,
3. Hessian,
4. French Chalk,
5. Barium Sulphate,
6. Paraffin Wax; and
7. Naphtha.

All these raw materials are locally available except electrolytic copper rods and tin.

Conclusion.—As we have pointed out earlier, before the war the Indian demand was met by imports and the main importers were the Indian branches of large British firms like, Henleys and Calenders etc. In normal times the Indian industry is bound to face a keen competition from the British concerns. But with the availability of raw materials locally and the quality of the Indian product being as good as the imported articles, the Indian Cable Industry is bound to survive the struggle.

8—ELECTRIC LIGHTING ACCESSORIES

Introduction.—The accessories for electric lighting include tumbler switches plain, tumbler switches with fuses for train lighting, tumbler switches single pole, one way with incorporated fuses, ceiling roses, plugs, wall sockets, cutouts, lamp holders, etc.

The materials from which most of these articles are made are bakelite, copper and brass.

The industry existed in India much before the war. All these accessories were manufactured in good quantities. The important concerns engaged in the manufacture were the following:—

1. The Swadeshi Industries Ltd., Calcutta.
2. The Bengal Potteries Ltd., Calcutta.
3. The India Moulding Co., Calcutta.
4. Bake O' Brass Ltd., Bombay.
5. Government Electric Factory, Bangalore.
6. K. Engineering Co., Lahore.

When the war broke out the imports fell off and this shrinkage of imports led to the establishment of new units the important of which are the Plastic Products of Singhanias of Cawnpore, Bestolite Co., of Bombay, and India Electric Works Ltd., Calcutta.

War-Time Development.—During the war the development of the industry was held in abeyance on account of non-availability of bakelite powder and other raw materials. Even before the war attempts were being made to find substitute for the bakelite powder. The Indian Lac Research Institute at Ranchi experimented with shellac ingredients for use as substitute for bakelite powder. The experiment, however, did not prove commercially successful although accessories were manufactured out of shellac powder. The products were not

satisfactory. During 1943 the Indian production of these accessories was of the following order:—

	Articles	Total Quantity
1.	Tumbler switches S. P. one way 5 amps. ...	48,000 Doz.
2.	Ceiling Roses, 2 plate, 5 amps.	50,000 ,,
3.	Plugs 2 pins 5 amps.	18,000 ,,
4.	Sockets 2 pins 5 amps.	18,000 ,,
5.	Cut-outs 5 amps.	72,000 ,,
6.	Lampholders, Bayonetcap cordgrip ...	24,000 ,,
7.	Tumbler switches, S. P. one way with incorporated fuses	4,800 ,,
8.	5 Amps. switch plug combination ...	1,000 ,,

Raw Materials and Machinery.—As we have pointed out above, bakelite, copper and brass are the chief raw materials. Bakelite powder has got to be imported and brass and copper are locally available. In addition to these, mild steel and steel wires are available from Indian producers. The machinery required for the manufacture of electrical accessories include capstan lathes, bench drilling machines, hydraulic presses, screw cutting and thread rolling plants and tabulating machines. Hydraulic presses are used for moulding purposes. Capstan lathes and drilling machines are available in the country.

Conclusion.—The production of these acessories has now greatly increased but simultaneously the demand has also increased. The local production is satisfactory in quality and compares favourably with imported articles. Electric lighting accessories are very cheap articles and it has to be seen whether the Indian industry can successfully face foreign competition without Governmental assistance.

6—CONDUIT PIPES

Introduction.—Conduit pipes are pipes made of steel which are used for covering electrical wires for inside-the-wall wiring. It is essential that wires near high temperatures should be conducted through Conduit pipes. Also they are necessary for flame-proof and gaseous installations.

They are of two classes. (1) Solid drawn and (2) Welded. Both of these types may be either galvanised or black enamelled. They vary from ½″ to 2½″ in diameter.

Before the war Conduit pipes were not manufactured in India. The Indian demand was met by imports. The industry was started during the war because foreign supplies were not available and the demand had considerably increased.

Present Position.—The firms that are engaged in the manufacture of Conduit pipes are small-size firms. During the war the Indian Hume Pipe Company of Bombay, one of the important Engineering concerns had manufactured Conduit pipes for the military on a large scale. But it is understood that they have now given up this line of manufacture although they had imported an electric welding plant for the purpose. Thus at present only the small concerns are in the field. The industry is a simple one as would appear from the process of its manufacture. The important raw material is the black steel sheets which are first cut into exact strips; then they are bent and welded. The two equipments which are necessary are steel roller and a welding plant, the former required for making the sheets even and rolling them in pipes and the latter for welding purposes. As a matter of fact the process is not exactly welding but joining the pipes when they are in melting condition. The factories at present engaged in the manufacture of Conduit Pipes are equipped with indigenous machines. The two raw materials namely M. S. Sheets and Carbides are also locally available and the labour required is sufficiently trained for the purpose.

Conclusion.—The Indian Conduit Pipes industry, has developed only during the war and being in the hands of new business men has not developed on proper lines and, therefore,

its capacity to face foreign competition is not sufficiently developed. The industry could not be equipped with suitable machinery because of war-time conditions and the incomplete plants improvised in India are not expected to help the industry to any great extent. In order, therefore, to enable the industry to take strong roots in the country it would be necessary to reorganise it, equip it with suitable machinery and in order to bring drown prices it would be necessary to carry on production on a larger scale.

7—BLACK ADHESIVE TAPES

Introduction.—Black Adhesive tapes are used for electric insulation. This industry was not in existence before the war and the Indian demand was met by imports which chiefly came from Germany and the U. K. As in the case of so many other commodities the curtailment of imports led to its manufacture in the country.

The production of black adhesive tapes was started in 1943 by two small firms of Calcutta. The total production of the year was only 2 tons valued at Rs. 14,000. In later years the production increased considerably.

Raw Materials and Process of Manufacture.—The raw materials needed for the industry are cloth, bitumen pitch and latex which are all available in the country. The manufacturing process is very simple. A definite quality of cotton cloth is dipped in a solution made of rubber and bitumen. Afterwards it is dried electrically, rolled and cut into pieces. The labour required is not highly skilled and can easily be trained.

Conclusion.—The present production of black adhesive tapes is sufficient to meet India's demand. During the war, the Industry was started with locally made machinery and the major portion of operation was done by hand. The black adhesive tape industry should be regarded as in important industry because its use is essential for the use of electricity. It is therefore necessary that the industry should be developed on proper lines.

8—DISTRIBUTION TRANSFORMERS

Introduction.—Distribution Transformers industry was started in India before the war on a small scale. After the war broke out the demand increased from the civil industries as well as due to the expansion of ordnance factories and increased distribution of electrical energy for the new military establishments. Before the war the imports of distribution transformers were as follows:—

	Rs.
1934-35	12,90,145
1935-36	19,00,665
1936-37	19,66,052
1937-38	26,23,071
1938-39	25,62,716

When the war broke out the imports fell off as would be evidenced from the following figures:—

	Rs.
1939-40	21,93,483
1940-41	19,11,763
1941-42	17,84,481
1942-43	13,44,309

Distribution transformers of standard industrial type upto 500 K. V. A. capacity and upto 11,000 volts on the H. T. side are required for use in every industry which depends on electrical energy and for the various electricity supply undertakings. The shrinkage of imports, expansion of workshops, ordnance factories, textile mills etc. led to an increased demand which was met by the expansion of the distribution transformers industry which was achieved by installing new plants imported from the U. K.

War-time Developments.—Before the war the Government Electric factory, Bangalore which was started in 1936-37, was the only producer of distribution transformers in India. During the war the Associated Electric Industries (India) Ltd., Calcutta and Crompton Parkinson (Works) Ltd., Bombay also

took up the manufacture of transformers. The former started production in 1941 and the latter in 1943. The production of distribution transformers, during the war increased considerably as would be seen from the following figures of production:

Production of Distribution Transformers.

Year	Quantity	Value. Rs.
Pre-war ...	... 60	60,000
1942 ...	... 200	2,00,000
1943 ...	... 600	6,00,000
1944 ...	... 1,500	15,00,000

During 1943 the share in the production of three producers was as follows:—

Govt. Electric Factory, Bangalore ...	200
Associated Electrical Industries (India) Ltd., Calcutta ...	250
Crompton Parkinson (Works) Ltd., Bombay ...	150

Raw Materials.—The chief raw materials and components used in the manufacture of Distribution Transformers are Electrical Steel Sheets, Cotton covered copper wires, copper strips, solid drawn steel tubings and insulating materials. With the establishment of Sankey Electrical Stampings Ltd., Bombay, the punchings were locally available but the sheets had to be imported. Although Tata Iron & Steel Co., Ltd., have begun the manufacture of Steel Sheets, their products have not been found suitable for distribution transformers. Cotton covered copper wire and strips are locally available and the rest of raw materials have to be imported.

Conclusion.—The inspection tests carried out by the Supply Department indicate that the average Indian transformers are of good quality and in no way inferior to the imported ones. It is estimated that the present Indian production can meet the Indian demand of the smaller types of transformers in full. But the Indian industry cannot be expected to

compete successfully with imports in the open market, the reason being that in countries like the U. S. A. and the U. K. production is perfectly balanced and on a large scale. In normal times the sale of distribution transformers has been controlled by electricity supply companies because they give extra facilities like free repairing, sale of transformers on easy instalment basis. Therefore the future of the Indian Transformer industry is dependent upon the policy adopted by the electric supply companies some of which are privately owned. It would, however, be essential to preserve the Indian industry as an adjunct to future industrialisation of the country.

9—DRY BATTERIES AND CELLS

Introduction.—The manufacture of dry batteries and cells had started in India even before the war but there was a large import also principally from the U. S. A. Imports also came from Germany, Hongkong, the U. K. and China. The following figures of imports for five years before the war would indicate the volume of trade which came to India from foreign countries:—

	Rs.
1934-35	15,08,965
1935-36	20,61,246
1936-37	25,73,053
1937-38	25,20,325
1938-39	
1939-40	22,80,251

The two chief manufacturers of dry batteries and cells in India were Esterella Batteries Ltd., Bombay and the National Carbon Co. (India) Ltd., Calcutta.

War-Time Expansion.—Dry batteries and cells are of great importance to modern army which relies to a great extent on W. T. in operations. During the war demands increased and at the same time imports fell off which led to the expansion of production at the two factories in the country. The increased production was achieved by working more shifts and by the establishment of a new factory by the ESTERELLA Batteries Ltd.

Production.—The present Indian production comprises dry batteries and cells, aircrafts wireless equipment, field telephones, torches, testing apparatus etc.

Raw Materials.—Cardboard, paper, corn starch, wheat flour, resin, and asphalt are some of the raw materials which, to a large extent, are locally available. Bare copper wire and cable are also available within the country. Imported raw materials and components required for the manufacture of dry

batteries and cells are ammonium chloride, zinc chloride, mercuric chloride, manganese di-oxide, zinc sheets and strips, acetylene lamp back and carbon electrodes.

Conclusion.—The present Indian production of dry batteries and cells can easily meet the major portion of the country's demand. Both the Indian firms had been all along successfully competing with foreign concerns and with their stabilised large-scale production there appears to be no reason why they should not hold their own even now.

10—SECONDARY BATTERIES

Introduction.—The Secondary batteries otherwise known as electric accumulators are mostly used by the motor car industry. The manufacture of secondary batteries started in India much before the war and the two important companies were Amco limited, Bangalore and the Esterella Batteries Ltd., Bombay.

There are two main types of secondary batteries: (1) The lead-acid type and (2) The alkaline type. The lead-acid type has plates of lead with an electrolyte of dilute sulphuric acid whereas the alkaline type has plates of iron and nickel with potassium hydrate as the electrolyte. There has been a recent development in the alkaline type in the manufacture of the nickel-cadmium cell which owing to its relatively low internal resistance finds much use in automobiles.

Pre-War Position.—The major portion of secondary batteries used in India before the war was imported. The position of imports during five years before the war was as follows:—

	Rs.
1934-35	7,50,027
1935-36	7,57,218
1936-37	6,37,910
1937-38	7,05,920
1938-39	6,33,945
1939-40	7,91,685

The biggest exporter was the U. K. accounting for about 90% of the trade in this line. The rest of the imports came from Germany and some other continental countries. The above figures of imports do not include batteries imported as parts of chassis of motor cars, lorries, cycles etc.

No quantitative estimate of India's production of secondary batteries for the period before the war or present production is available.

War-time.—War brought a rise in demand which led to the establishment of an additional unit namely the Standard Batteries Ltd., Bombay. The other existing concerns also expanded their production.

Conclusion.—The important raw materials used for the manufacture of electric accumulators are lead refined, antimony, letharge, red lead, sulphuric acid and sealing compound which are locally available. The imported components are containers, Vent plugs, and separators.

Fearing the competition from well-established foreign concerns which manufacture on a very large scale and hence are able to sell at cheap prices, the industry has submitted its case to the Indian Tariff Board for protection. At present except some of the operations like plate-forming, the entire process is done by hand and, therefore, the cost of production goes up. It is, therefore, necessary that latest types of equipment are installed for making methods of production up-to date, but before that is done it would be necessary for the Government to help the industry.

SECTION VII

STRUCTURAL ENGINEERING

Introduction.—Structural Engineering is one of the most important branches of the Engineering Industries. It is a specialised industry and requires large workshops and mechanical equipments on a large scale in order to carry it on. The work carried on is mostly of the jobbing nature which implies that the same machinery can be utilised for manufacturing a large number of structures of widely different varieties.

In normal times India produces the following categories of structures:—

(1) Aeroplane hangars of various designs and construction,

(2) Jetties,

(3) Pressed Steel Tubs, cisterns etc.

(4) Pressed and building steel work of different kinds,

(5) Oil value Derricks and Tripods,

(6) Railway bridges and road culverts and bridges,

(7) Steel frame structures for building, workshops, warehouses etc.

(8) Structures for supporting special plants,

(9) Floating docks etc.

Before the war, the Structural Engineering Industry was definitely established in the country. It was highly concentrated in and around Calcutta and in the Provinces of Bihar and Bombay. The Industry to begin with was started by English firms as a corollary to the Railway development in the country, when in the middle of 19th Century the Government of India undertook to start the new highways railways.

War-time Development.—In war-time also the Structural Engineering Industry manufactured almost the same articles as produced in peace time except that in certain cases they became the military versions of the types produced. One of the important achievements of the Industry during the war was the manufacture of floating docks. Another departure

during the war was the concentration of the industry on as few items as possible in order to accelerate production and for that purpose the military standardized the structures and the industry was obliged to conform to them. For instance, in normal times the steel frame structures were made for workshops, warehouses, residential buildings and sheets. This implied that each structure was designed separately according to the needs of the indentors. But they had been standardized during the war because the military required a large number of them and time was an important factor.

Before the war India's capacity of structural engineering was not utilised to the full. The war time demand gave a strong fillip to the industry and the capacity to-day may be estimated at anything between 1 lakh and 1½ lakh tons per year.

After the general survey of the Structural Engineering Industry we shall examine the development that took place in some of the important branches of the Industry.

Bridges.—As pointed out above, in peace time bridges were designed for roads and railways according to the requirements of each place. For example, the Howrah Bridge which was constructed by Messrs. Braithwaite, Burn & Jessop Company Ltd., was the signal achievement of the Structural Engineering Industry of the country. During the war unit construction entered the field of bridges building also. What are known as Hamilton Bridges began to be manufactured. These bridges may be large and small but their parts are interchangeable.

The amount of steel consumed in the construction of bridges had considerably increased during the war, as will be evidenced from the following figures:—

Year	Steel used (in Tons)	Value (in Rupees)
1940 ..	1,381	8,91,000
1941 ...	10,300	19,95,000
1942 ...	11,500	68,00,000
1943 ...	22,000	1,18,00,000

Aeroplane Hangars.—In the Structural Engineering Industry the manufacture of Aeroplane Hangars did not come to much before the war but the demand for them increased tremendously during the war as would be seen from the following table:—

Year	Tonnage of Steel consumed	Value (in Rupees)
Pre-war ...	793	6,60,000
1940	3,396	32,66,000
1941	135	56,000
1942	2,000	13,24,000
1943	10,500	44,66,000
1944	22,000	60,00,000

Floating Docks.—The manufacture of items connected with ship building do not, technically speaking, come within the scope of the Structural Engineering Industry but during the war the structural firms do some work in the field of Marine engineering also. Some of the Engineering factories manufacture small steel Barges and Floating Docks. Three such floating docks were constructed in India and one of them is said to be the largest in the world. Other items manufactured include ferry Pontoons, D. T. N. flats etc.

Location of the Industry.—As pointed out earlier the Structural Engineering Industry is highly concentrated in and around Calcutta, in the vicinity of the two big steel works, and in Bombay. The reason for this high concentration is due to the nearness of the port of Calcutta and the availability of raw materials like lime stone, coal, steel, etc. About 75% of the industry is located in the provinces of Bengal and Bihar. The important units of the Industry in the Calcutta area are Messrs. Jas. Alexander & Co., Ltd., Messrs. Kusumika Iron Works, Messrs. National Iron & Steel Co., Messrs. Hind

Machines Limited, B. B. J. Group, Messrs. Steel Equipment and Construction Co., Ltd., Messrs. Burn & Co., etc.

In the Bombay area Structural Engineering Works Ltd., Messrs. Garlick & Company, Messrs. Richardson & Cruddas, Messrs. Alcock & Ashdown Company Ltd., are the important firms. There are few firms in Karachi, Madras, Cawnpore etc.

Conclusion.—Before the war the Structural Engineering Industry did not fare very well. Such demands for Structural work as were there mainly came from P. W. D., Railways, and only a small proportion of the demand emanated from the civil industries. Now that the conditions have changed and India is going to embark on a large-scale industrialisation programme, the industry is expected to play an important part in the national economy of the country. Large reconstruction programmes of roads, railways and bridges and port expansion have already taken place and are benefitting the industry. In the years to come the Structural industry of India is bound to develop to a large extent on account of these developmental programmes.

SECTION VIII

SHIPPING AND SHIP-BUILDING INDUSTRY

Introduction.—Economic exploitation is the inevitable outcome of political subjugation. The history of British *raj* over India extending over to more than a century and a half is perhaps most tragic that the people of a subject nation ever happened to have. India was exploited politically, culturally and economically. Perhaps the darkest chapter in the history of the British shall be how the Britishers—the nefarious agents of the East India Company and other interests in England committed the commercial rape on the Indian people. This economic exploitation was a simultaneous move on all the sectors of Indian Economy. We shall here be concerned with the ship-building industry of India. We shall see the dominating position which the Indian shipping held at a time when other nations, including of course England were not even in the initial stages of development. We shall see how the British interests, the absence of any shipping policy of the Government of India and other factors all conspired together to destroy the Indian ship-building industry. We shall also discuss the present position and the proposed steps to develop the Indian National shipping. But before we devote ourselves to these we shall have a brief discussion of the place of shipping in maritime countries. This will help us in making a comparative study of the Indian Shipping and the colossal neglect which the Government of India showed deliberately to nip the development of Indian National Shipping in the bud.

Lest there should be some confusion we wish to be clear about the two terms 'shipping' and 'shipbuilding'. The fundamental difference between Indian shipping and foreign shipping lies in the ownership, control and management. This, however, does not preclude the employment of non-Indian nationals as servants by the Indian shipping companies. According to this criterion the term 'Indian shipping' should denote shipping *owned*, *controlled* and *managed* by the nationals of India.

As regards shipbuilding the term refers to the manufacturing and repairing of ships by the firms or companies *owned*,

controlled and *managed* by the nationals of India. An Indian shipping company may not be building ships; it may simply be buying ships either from abroad or from the shipbuilding firms in India. The difference, therefore, between Indian 'shipping' and 'shipbuilding' is not of great significance. The two are so closely connected that one cannot be discussed without a reference to the other. Some overlapping is inevitable.

Importance of Shipping in Maritime Countries

Every country possessing sea coast whether large or small considers the shipping as one of the most valuable assets. It is a powerful instrument of national economic policy, a vital necessity for the development of trade and commerce and finally the second line of defence. In the Merchant Marine Act, 1936 of the United States of America it has been laid down that:—

> "It is necessary for the national defence and development of its foreign and domestic commerce that the United States shall have a Merchant Marine (*a*) sufficient to carry its domestic water-borne commerce and a substantial portion of the water-borne export and import foreign commerce......, (*b*) capable of serving as a naval and military auxiliary in time of war or national emergency, (*c*) owned and operated under the United States flag by Citizens of the United States in so far as may be practicable and (*d*) composed of the best equipped, safest and most suitable types of Vessels constructed in the United States and manned with trained and efficient citizen personnel. It is hereby declared to be the policy of the United States to foster the development and encourage the maintenance of such a merchant marine."

These are far reaching and heartening declarations of national policy encouraging the development of national shipping by one of the most important maritime countries of the world. India is a country possessing a coastal line of about 5,000 miles. She has an extensive coastal as well as overseas trade. Besides, the Indian Ocean occupies a strategic place in the south and south east Asia. All these considerations make it a vital necessity that India should have a large and powerful

navy both of supply and defence. We have stated above the national shipping policy of the United States of America; similar is the policy of England and other leading maritime countries. But India is the only outstanding exception which has no national policy. The Government of India have adopted a policy of utter negligence and apathy; Indian nationals have not been protected—nothing to say encouraged in their effort to develop the national shipping.

Ships travel both in national and international waters. It is inconceivable that a maritime country can afford to ignore the necessity of securing the legitimate place for her shipping in international trade. Shipping as a means of transport has been practised from times immemorial and it still occupies by far the most important place. It has been estimated that shipping carries over three quarters of the world's trade and under no system of transport the place of shipping can be conceived to diminish—the reason being that water transport is the cheapest. Sea has always been a supreme issue of national policy and shipping has been the most effective means of extending trade and territories. The history of England, France and Portugal during the mediæval period is a testimony to this statement. A merchant marine is a factor of such national importance in war as well as in peace that no nation can afford to neglect the development of its national shipping in the overseas trade. It is, however, a tragedy that what other nations did to build up their national shipping Government of India not only did not do but on the other hand discouraged Indian shipping. India was a dependency; her interests were subject to modification to the interests of the British trade and commerce.

Early History of the Ship-building Industry in India.—It is an undisputed fact that Shipbuilding was one of the major industries in ancient India and it flourished even under the East India Company right up to the middle of the nineteenth century. Even before the advent of British in India, Indian ships used to sail to distant lands with the merchandise of indigenous make. History bears testimony to the fact that the Indian Merchants made very long voyages with goods and made fabulous profits. Kautilya's *Arthshastra* refers to these

merchants at several places in connection with the percentage that ought to be taken by the King by way of imperial dues. Shipping was carried on successfully during the Mauryas, the Guptas, the Maghuls right up to the establishment of the East India Company. We shall not make our discussion lengthy by going into details of the position of shipping in pre-historic and mediæval period. It is sufficient to point out that shipping was a flourishing industry in India. Ships have been built in India from times immemorial but the position changed materially when wooden sailing vessels were replaced by steel made steam-driven ships as a result of the epochmaking improvements in marine construction technique which took place in the mid-19th century. In the East India Company's days, fine sailing ships were built in India especially on the West Coast with the teak of the Western ghats which was then the best material available for the construction of ships. Some of the vessels thus built in India did splendidly in the British fleet as well as in the mercantile marine. Speaking of the Indian ships Lord Wellesley remarked in 1800, "From the quantity of private tonnage now at command in the port of Calcutta, from the state of perfection which the art of shipbulding has already attained in Bengal, promising still more rapid progress and supported by abundant and increasing supplies of timber, it is certain that this port will always be able to furnish tonnage to whatever extent it may be required, for conveying to the port of London the trade of the private British Merchants of Bengal." This attitude was strongly resented by powerful interests in England. Because of the fact that Indian ships were more beautiful, more durable and more economical than British vessels an alarm was raised in England that the British shipbuilding industry was doomed to be eclipsed if the rapidly developing Indian shipping industry was not discouraged.

It has often been alleged that after the introduction of steam navigation the nature of shipbuilding changed and India became handicapped in this matter. Does it stand to reason that a country which had developed the building of sailing ships to such a degree of perfection could not have easily adopted the new invention of steam ships? It was not the advent of the steam ship about the middle of the nineteenth century, when iron and steel took the place of wood, which led to the decline

of Indian ship-building industry. It was the open hostility of the British Government such as the banning of Indian ships from British waters and the deliberate negligence and apathy of the Government of India that led to its decline and ultimate ruin. There was no way left for the Indian shipping industry but to advance towards the inevitable destruction in the face of adverse circumstances. On the grave yard of Indian shipping British shipping flourished.

Although large vessels were not built in India, inland water steamers from 20 ft. to 300 ft. long harbour launches, motor launches and dumb craft for transporting cargo to and from ships were being built in large numbers. In Bengal the construction of such inland water vessels was undertaken by the 'River Steam Navigation Company' and 'India General Navigation and Railway Company'. Such vessels have been in great demand there because there is an extensive inland trade passing through the broad rivers and lagoons of that province.

Country Craft have always been built in large numbers especially on the West Coast, and numerous skilled craftsmen found employment in this country.

Just before the commencement of the first world war some larger vessels had also begun to be constructed. Calcutta had begun to build sea-going tugs up to 440 tons The opportunity presented by the war of 1914-18 brought into prominence two outstanding problems. In the first place the submarine menace presented the question as to whether India could any longer rely entirely and exclusively upon foreign shipping for the carriage of her trade. In the second place with a gradual disappearance of a large part of the world shipping and the acute shortage of tonnage there was no reason why India should not take steps to develop her mercantile marine industry. It is, however, interesting to note that what the Government of India did was simply to create a ship-building branch of the Indian Munitions Board and to borrow the services of British Officers to examine the possibilities of ship-building in India. In the end, the Government came to the conslusion that the encouragement of wooden ship construction was possible during the war, but the construction of steel ships was not possible. In order to encourage the building of wooden ships the Government of India provided

certain indirect forms of assistance to constructing firms but that was all.

The Position of Shipping During the Inter-war period: Attitude of Government of India towards National Shipping.—Just after the cessation of the first world war the Scindia Steam Navigation Company was brought into existence in 1919. This was the turning point in the history of Indian Shipbuilding. The first phase of Indian Shipbuilding was almost extinct. The Scindias opened a new chapter. Since then Indian shipping has been struggling bravely to survive and develop. "Its history has been, for the National Shipping Companies, a sad story of ceaseless struggle and sacrifice; for the people of the land it is a painful chapter of bitter disappointment and disgust at the lack of response from the Government of India to their demand for stability and expansion and for the Government of India it is a tragic tale of broken promises unredeemed assurances and neglected opportunities."

The general trend in the inter-war period has been for Governments of the important maritime countries to intervene increasingly in the interests of their mercantile marines, national merchant fleets have been created where none existed. But so far as India was concerned the Government of India pursued a policy of inaction throughout the period under review, *viz.* 1918-1939. The tragedy of the situation was that at the time when the Second World war broke out Indian tonnage was less than 0·24 per cent. of the tonnage of the world. There was a loud chorus of protest both from the press and the platform, from inside and outside the legislature against the policy adopted by the Government of India. But they paid no heed to these protests. Every martime country of any importance was developing its marine on grounds of national welfare and security. It was, however, no concern of the Government of India to take lessons from these countries. The doctrine of *laissez faire* was their only excuse, leaving things as they were was their only guide. They took no action. Indian shipping did not grow—could not grow.

Handicaps in the way of Ship-building during the inter-war period.—During the period between 1919 to 1939

the Indian shipping industry encountered several difficulties, the chief of them being the following:—

(*a*) *Patronage to British Shipping.*—A large number of foreign companies were operating in the trade routes of India, but the most powerful among them was the British India Steam Navigation Company. It is this Company which has dominated the coastal trade of India for several decades past. It is this Company which has by its powerful financial resources and ruthless freight wars, drove away one Indian Shipping after another from the coastal waters of India. Instead of giving protection to Indian Shipping Companies the Government of India missed not a single opportunity to extend its patronage to this British Company and thus encouraged it in every way to act against the national interests of the country. The granting of Royal Mail subsidy, the exclusive right of carrying Government and Railway Cargo and passengers, the division of traffic between the railways and the British Shippping Company at the cost of Indian trade were some of the ways in which patronage was extended and monopoly was allowed to be created.

(*b*) *Cut-throat Competition of British Shipping and Rate-cutting.*—In the twenties and thirties all the Indian Companies which were of course newly brought into existence faced such ruthless rate-cutting and cut-throat competition that many of them had to close their doors. Backed by very strong financial position, supported by their own Government and patronized by the Government of India the B. I. Steam Navigation Co. presented a severe competition to the Indian Companies. The Scindia Steam Navigation Co. was the strongest company, but it found the ground slipping under its feet when it was faced with the rate-cutting war of the B. I. Co. In 1920 the rate for carrying rice from Rangoon to Bombay was Rs. 18 per ton. Upon the Scindia Ships being put into operation the B. I. Co. began to reduce the rate per ton until it came to Rs. 6 per ton when operating cost was Rs. 14 per ton. As a direct and cumulative result of this war the Scindia Co. lost several lakhs of rupees and if the Company did not fail it was due to patience and resolute will of the promoters to keep the company surviving.

(*c*) *Deferred rate System.*—A brief reference should be made to this point also. The underlying principle was that the shipper should have a strong incentive to transport his goods by the ships of the line or lines who have undertaken to provide regular sailings. A certain percentage of rebate was granted to the shipper if he patronised the company for a particular fixed period.

War-time developments and the present position of Ship-building.—Various circumstances made it necessary for the Government to take action in regard to ship-building and marine engineering, as most of the machinery required—Punching, Beam Bending, Angle Shearing Machinery, Plate Straightening and Bending Polls, Pneumatic and other machine tools, cranes etc. were obtained from the U. K. but further progress was delayed by the war taking a serious turn. Ship-building firms in the United Kingdom, Australia, Canada and South Africa were overloaded with orders for ships both naval and merchant. It was found impossible to bring out from the U. K. vessels required for the defence of India. An urgent need also arose for mine-sweepers and escort craft.

The Government of India, quite alive to the situation and the urgency of establishing the ship-building industry in the country invited the opinions of the various major firms and in consultation with the then Commerce Member (the Hon'ble Sir Ramaswamy Mudaliar), the Admiralty and the Supply Secretary embarked upon a scheme for the construction and fitting out of various types of craft.

In 1942 a large programme of ship-building and construction of small craft varying from 10 ft. dinghies to 42 ft. per hour launches was pushed through. Considerable difficulties in obtaining timber and fastenings had to be overcome in addition to the no smaller bottle-necks of lack of supervisory and inspecting staff, slowness of delivery of locally ordered component and the poor standard of workmanship which impeded the progress of the industry.

Inspite of such obstacles, the ship-building industry has made considerable progress and the new constructions covered a wide range from steel mine sweepers down to local defence

craft. Fairly large orders for life boats and other smaller crafts down to 16 ft. dinghies were carried out. Till June 1944, new constructions numbering about 700 had been carried out and these ranged from 15 barset trawlers, 2 escort vessels, and 254 small craft. About 1,100 vessels of all classes were constructed in 1944-45 not to speak of the large numbers of wooden barges for carrying cargo.

Inspite of the strangling competition of British Shipping and the absence of an active policy on the part of the Government of India to encourage the formation and growth of a strong national fleet, it is surprising that private enterprise in this country has during the last two decades succeeded in building up a merchant marine of 13 lakh tons. The following figures show the distribution of this small Indian tonnage:

Number and tonnage of Indian Ships in 1946.

Name of the Company	No. of Ships	G. R. T.
(1) The Scindia S. N. Co., Ltd.	16	75,248
(2) The Mogul Line, Ltd.	6	26,545
(3) The Bombay S. N. Co., Ltd.	13	11,200
(4) The Bengal Burma S. N. Co., Ltd.	8	5,209
(5) The Merchants S. N. Co., Ltd.	2	2,183
(6) The Eastern S. N. Co., Ltd.	2	2,144
(7) The Indian Corpn. N. & T. Co., Ltd.	3	1,297
(8) Kalmersund S. N. Co., Ltd.	1	1,158
(9) The Malabar Steamship Co., Ltd.	1	857
(10) Shree Ambica Steam Nav. Co., Ltd.	1	751
(11) The Ratnagar Steam Nav. Co., Ltd.	1	590
TOTAL ...	49	1,27,182

Quite recently the Scindia and its associated companies have bought and are building some ships the approximate tonnage of which will be about a lakh of tons and the India Steam Navigation Company has purchased 8 ships of approximately 60,000 tons gross. The Bharat and Malabar Steam Navigation Company have acquired six ships of 23,219 gross tons.

The Royal Indian Navy is thus steadily growing. The Government has to see that it is firmly established and expanded because of its healthy repercussions on the nation-building activities of the state other than its earning capacity in the immediate future and the cheap transport it will afford. Just as strategic railways in the North West were built and maintained irrespective of their earning capacity as an insurance to provide for the risks of war, so is the ship-building industry to be organised and maintained not only to build ships to carry merchandise but to provide in peace for the contingencies of war so that when required (*a*) the personnel and skill employed in building merchant ships can be diverted to construction of warships and (*b*) its ship-yards may harbour and repair ships of war and may refit merchant ships to uses of war.

Ship Repairs.—Before the war ship-repair work was confined to the two major ports of Bombay and Calcutta and the firms did little beyond repairing and maintaining a small number of ships plying in the Indian Ocean. Small inter-voyage repairs were also carried on. The graving docks at Calcutta and Bombay were used for cleaning and coating the under water hulls of merchant ships and maintaining the under water fittings.

As the war took a serious turn and Japan entered the war, when the Far East ports fell, India became the front line for operational purposes. The need for repairs increased tremendously and numerous ships having been damaged by enemy action resorted to the nearest Indian port for repairs.

Under the existing stage of development, however, India was not equipped for undertaking such repair work. Plant and equipment available at Indian ports were not up-to-date. With the growing importance of ship repairs, therefore, the

Directorate General of Shipbuilding and Repairs was set up with Bombay as its head quarters.

The chief materials required for ship repairs are articles made from steel and non-ferrous metals, boiler and condenser tubes, timber and electrical fittings including cable. The U. S. A. and the U. K. were at one time the chief suppliers of these materials. But now India supplies most of them. Most of the non-ferrous metals and part of the electrical cables are obtained in India. The timber required is teak and coniferrous wood both obtained in India. The extent of the repairing work done can be gauged from the following figures for the calendar year 1943.

Merchant ships repaired during 1943.

Port	Number	Gross tonnage
(1) Bombay	965	6,311,133
(2) Calcutta	653	3,433,835
(3) Karachi	3C5	1,671,943
(4) Madras	92	504,753
(5) Vizagapatam	54	134,401
(6) Cochin	50	250,754
TOTAL ...	2,119	12,306,819

A large number of firms are engaged in ship-repairing work and it is hoped that they will carry on successfully if the handicaps in their way with regard to plant and equipment and necessary raw materials are removed.

Labour.—The supply of skilled labour was a serious problem from the start. There are indeed in the country craftsmen with experience in constructing the traditional types of the wooden country craft but it was not an easy job to train them to undertake new work connected with mine sweepers etc. The Technical Training Scheme may later prove useful but it takes

time to materialise. After the fall of Burma some Chinese labour became available. Later on Italian prisoners of war were employed in ship-building and ship-repairs. The total number employed in the industry in 1943 was in the neighbourhood of 50,000. Supervision of labour has been found a difficult problem. This was relieved by employing evacuees from Singapore and the Far East. The labour problem is still a serious one and it calls for careful tackling.

Proposed steps to develop the Indian National Shipping.—We have shown in our discussion that to our great misfortune India had no shipping policy in the past. The foreign companies prospered at the cost of indigenous shipping companies. It is encouraging that the Government of India have now realised the folly of the past and the cost which they have had to pay for the criminal neglect which they had shown towards ship-building. The vulnerability of India's position has been revealed by the stress of wartime competition but by no means more glaringly than by her inability to find adequate shipping from her own resources to provide for the transport of the food supplies required by her. A bold and definite post-war shipping policy is necessary not only for commercial reasons but also because the development of the Royal Indian Navy necessarily implies the simultaneous development of the merchant navy.

The acquisition of an adequate share in the world's carrying trade should be the aim of our post-war shipping policy and to this end steps should be taken to secure for Indian shipping—

(*i*) an increased share of the coastal trade, including trade with Ceylon and Burma (The present share is estimated at between 20 to 30 per cent);

(*ii*) a substantial share in the near trades *e.g.* Persian Gulf, East Africa, Malaya and Dutch East Indies;

(*iii*) a fair share in the Eastern trades, especially those trades of which Japanese shipping will have been dispossessed;

(iv) a fair share also in the trade between India on the one hand, and the U. K., the Continent of Europe and North America on the other; and

(v) in order to give maximum relief to the railways, a number of steps should be taken to ensure the fullest utilisation of country craft and to prevent wasteful competition between country craft and steamers. As India may have to look to all forms of transport to sustain her economy in the post-war era, the continued development of country craft will have to be considered. Coordination of steamer and country craft services is an essential part of this development, subject to due regard being paid to the different needs served by steamers and country craft.

Although the above policy is not as decisive, dynamic and heartening as that laid down by the United States of America and Great Britain for their own shipping, we are glad to note a welcome change in the approach of the Government of India.

There is a fairly widespread tendency on the part of the maritime nations to reserve coastal trade to the national flag. Almost all the European countries had their coastal trade reserved at one time or the other. But India inspite of a large coastal trade never had the fortune of such a favour. As the following figures show the percentage of coastal cargo lifted by all the Indian companies is less than that lifted by one company, namely the British India Steam Navigation Co., and it is far less than all the non-Indian Companies put together.

Cargo lifted by Indian and Non-Indian Companies.

Year	Total Cargo lifted by Indian Companies (tons)	Total Cargo lifted by British I. S. N. Co. alone. (tons)	Total Cargo lifted by all the Non-Indian Companies Including B. I. S. N. Co. (tons)
1933-34 ...	17,24,191	30,24,841	52,45,269
1934-35 ...	16,67,003	29,97,758	55,32,455
1935-36 ...	16,58,871	27,49,902	51,54,120
1936-37 ...	17,69,294	27,42,352	47,78,821
1937-38 ...	17,24,788	30,15,948	49,02,698
1938-39 ...	20,19,735	30,16,998	50,98,550
TOTAL ...	1,05,63,882	1,75,47,799	3,07,11,913
Average p. year	17,60,647	29,24,633	51,18,652

Percentage on total liftings : Non-Indian Shipping Companies ... 74·40%

Percentage on total liftings : Indian Shipping Companies 25·60%

100·00%

The above figures are self-revealing. Of the total coastal cargo Indian ships were allowed to lift on an average 25·60 p.c. There is no reason why Indian ships should not have the opportunity of capturing the whole of the coastal cargo when other leading maritime countries have adopted similar policy. The target should at least be 75 p.c.

Then Indian ships should be given the legitimate share in the near trades in the Persian Gulf, East Africa, Malaya and Dutch East Indies. It has further to be noted that while the

tonnage in the world to-day is far in excess of the needs and requirements of international trade, both the United Kingdom and the United States are determined to maintain and expand their shipping to the largest extent possible. It is maintained by them that "from the broad economic point of view, shipping services, like other exports, should be left in the hands of those countries which can specialise in them and carry them out most efficiently and cheaply." The world cannot, however, now forget the lesson taught by the last two wars that both on the ground of national economy and defence every country should possess a strong national shipping. Under these circumstances India will have to put forth her legitimate claims at International Conferences and secure her position in the coastal as well as the world trade. But all this presupposes one condition and that is that every encouragement should be given to the ship-building industry to build strong and well equipped ships. The Government of India should in the interest of national economy and defence try their best to remove all the hindrances that have so far been blocking the way of growth of the Indian Shipping.

SECTION IX

MISCELLANEOUS

I—COATED ABRASIVES INDUSTRY

Introduction.—Coated Abrasives are essential consumable stores, and they are extensively used in all industries and handicrafts as the media for abraiding, polishing and sharpening materials of all types. The large consumers are engineering firms, automobile works, leather factories, railways and furniture makers, who use these stores for engineering purposes, wood-working, rubbing down filler surfaces, paint and lacquer-ware surfaces etc. The industry has made considerable advance in recent years. We shall briefly discuss the past history, its present position and the future prospects.

History of the Industry.—Abrasives industry in India dates back to the year 1929 when the Strawboard Manufacturing Co., of Lahore established its factory in Saharanpur (U. P.), primarily for the manufacture of strawboards, and took the manufacture of coated abrasives as a second line of production. It should be remembered that the year 1929 marks the beginning of that economic blizzard which swept over the whole world. The factory, therefore, went on struggling hard for making the production of abrasives a success but much headway could not be made due to the factors over which industry had no control.

Another landmark in the history of abrasive industry is the formation of the firm of Messrs. Krishnalal Thirani & Co., Ltd., who established their factory in Calcutta in 1934. The factory of Messrs. Krishnalal Thirani & Co., Ltd., started actual production in the year 1938.

The outbreak of the world war 1939 brought fresh hope for the Abrasive Industry firstly because the war itself brought good demand for various abrasives and secondly with the progress of the war the foreign sources of supply were cut off. This opportunity was very successfully taken advantage of by a new firm started under the style of Messrs. Ajax Products Ltd., which from the point of view of capital investment and production is by far the largest unit in the country. Ajax Products Ltd, obtained their entire plant from the U. S. A. in 1939. About 50 percent of the total capacity of the industry was utilized during the war period, and the rest of the capacity

remained idle as the supply of raw materials had been irregular. Besides producing on mass scale ream sizes, sheets, rolls, discs, tapes, belts and other usual abrasives materials, the Ajax Products Ltd., manufacture Garnet Paper, Ajaxite Paper and Ajaxite Cloth, Silcon Paper and Silcon cloth.

Localisation.—To-day the number of concerns engaged in the manufacture of abrasives is six of whom three (1) Messrs. Krishnalal Thirani & Co., Ltd., Calcutta, (2) Messrs. Ajax Products Ltd., Madras and (3) The National Sandpaper Mills (India) Ltd., Rawalpindi are the chief producers. It will be seen that they are scattered all over the country, a favourable factor so far as marketing is concerned. Two of them situated in port cities of Madras and Calcutta have the advantage of importing raw materials as well as of exporting their products if need be.

Equipment and Capital.—The capital invested in the industry must be somewhere about 25 lakhs of rupees. The work is carried on by automatic machines and thus latest development in the process of manufacture of abrasive has been incorporated. Their operation is very simple mastery over which is acquired by intelligent Indian labour without unduly prolonged training. One single workman properly trained for the purpose is enough to look after these automatic machines. This reduces the necessity of employing a large number of labourers with the result that the labour charges of the industry are low and with further progress of the industry cost of production of the industry is expected to go down considerably.

Raw Materials and the Position of Supply.—The chief raw materials required for this industry are:—

(*a*) Natural Abrasive minerals, such as quartz, garnet, corundum and emery;

(*b*) Synthetic abrasive minerals, silicon carbide and aluminium oxide grains;

(*c*) Special Type backing (Kraft) paper, cloth and vulcanized fibre; and

(*d*) Hide-glue as a bording material.

Of these emery is imported from Turkey, and Silicon Carbide and Aluminium oxide grains, Kraft paper and Vulcanised fibre from U. S. A. All the remaining raw materials are available in India.

During the war emery could not be imported freely from Turkey, so indigenous corundum was used as a substitute. But though abrasive properties are said to be better than the Turkish emery, its cost is excessively high. Corundum is mined in Rewa State by Messrs. Katas of Amritsar, in Salem by Messrs. Ajax Products Ltd., and also near Tatanagar by others. It has been estimated by the Tariff Board that the Indian Manufacturers had to pay a price ranging between Rs. 450 and Rs. 600 per ton for indigenous corundum because Turkish emery was not available. The supply of indigenous corundum is also said to be inadequate at the present time. So far as Synthetic grains are concerned, they are products of electric furnaces and there does not seem to be any likelihood of these grains being produced in India in the near future.

Estimated Demand.—In 1943 the value of imports of coated abrasives was Rs. 6 lakhs and the value of indigenous production Rs. 21 lakhs. Of this abrasives worth Rs. 9 lakhs were taken by the Defence Services and abrasives worth Rs. 18 lakhs were left for civilian use. This is estimated to represent some 1,04,000 to 1,35,000 reams of abrasives. In the opinion of the Tariff Board in the next few years the total demand is not likely to exceed Rs. 20 lakhs a year in value, which would represent a quantity of roughly between 60,000 and 1,00,000 reams.

Imports.—In the pre-war days almost the entire demand was met from imports and U. K., U. S. A., Italy and Japan were the chief sources of supply. The Department of Industries and Supplies, Government of India has furnished the following figures for imports of coated abrasives during the last few years:—

Value of Imports.

Year	(in lakhs of rupees)
1939	4·34
1940	7·85
1941	6·61
1942	not available
1943	6·08
1944	6·59
1945	11·41
1946	7·2 (licensed)

Domestic production.—In 1943 the domestic production reached its highest figure when abrasives to the value of Rs. 21 lakhs were produced by indigenous manufacturers. This would mean a quantity of between 84,000 to 1,04,000 reams and was about 50 per cent. of the rated capacity of domestic manufacturers. The rated capacity of Indian Manufacturers is estimated as follows:—

(On the basis of two shifts a day)

		Reams.
1.	Ajax Products Ltd.	60,000
2.	Krishnalal Thirani & Co. ...	36,000
3.	National Sand Paper Mills Ltd. ...	36,000
4.	Strawboard Manufacturing Co. ...	24,000
5.	Others (including Cottage producers)	44,000
	Total ...	2,00,000

It will be seen that productive capacity is higher than the domestic demand.

The Question of Protection.—Inspite of the fact that the rated capacity of the domestic production is higher than the probable demand the industry is faced to many difficulties. The indigenous manufacturers have to overcome the prejudice in favour of the foreign product. Again an important reason why additional margin of protection should be granted is that by the end of the proposed period of protection (*i.e.*, 31st March 1941) the indigenous industry would be able to establish itself on a strong and independant footing in respect of sand/flint/glass paper and very nearly on a competitive level with the importers in respect of emery cloth.

The Tariff Board, having considered the claim of the industry, have recommended for protection as follows:—

(1) "The present revenue duties on abrasives papers, the standard rate being 36 per cent. *ad valorem*, the preferential rate on imports from U. K. 24 per cent. *ad valorem* and the preferential rate on imports from

Burma 12 per cent. *ad valorem* should be converted into protective *ad valorem* duties and be maintained for the period ending 31st March 1949.

(2) The present revenue duty on emery cloth which is 30 per cent. *ad valorem* should be replaced by a protective duty of 40 per cent. *ad valorem.*

(3) All abrasives, coils, discs, belts, shapes, tapes, etc. made of paper when they are imported as stores apart from machinery should be subject to the same protective duties as abrasive papers.

(4) All abrasive rolls, coils, discs, bolts, shapes tapes etc. made of cloth or combination of paper and cloth, should be subject to the same duties as abrasive cloth.

(5) The present revenue duty of 30 per cent. *ad valorem* on Synthetic grains should be refunded in the case of firms producing coated abrasives paper and cloth of all grades, shapes, and sizes.

(6) The present revenue duty of 30 per cent. *ad valorem* on emery and kraft paper should be refunded in the case of firms producing coated abrasives paper and cloth of all grades, shapes and sizes.

(7) All facilities should be given for the exportation of coated abrasives from India.

(8) The Engineering Association of India should be moved to take steps to prescribe suitable standard specification for indigengous coated abrasive.

The Government of India have, after careful consideration decided to accept all the recommendations of the Board except Nos. (2), (4), (5) and (6) stated above.

(1) In regard to abrasive papers the existing standard rates of 36%, 24% and 12% have been respectively replaced by 36%, 24% and 12% protective duties and they will remain in force up to 31st March 1949.

(2) With regard to emery cloth the Government have come to the conclusion that the existing revenue duty of 30%

ad valorem affects adequate protection to Indian Manufacturers and have, therefore, decided to convert this duty into a 30% protective duty instead of 40% as recommended by the Board.

(3) With regard to the recommendations (5) and (6) Government consider that since the protective duties proposed above would give sufficient protection to the industry the grant of further measure of relief by way of refund of 30% revenue duty on synthetic grains and emery and kraft paper is unjustifiable.

(4) The Government will be prepared to grant requisite facilities whenever they are approached by manufacturers for exportation of coated abrasives from India.

(5) Finally Department of Industries and Supplies will take steps to prescribe suitable standard specifications for indigenous coated abrasives.

Conclusion.—Bearing in mind the above steps which the Government of India have proposed to take to help the industry it is believed that India's needs except for very special items, can be met by local manufacturer and there would be no necessity for importing emery paper and cloth even of the best quality. Finally it is also believed that the protection proposed to be given will be sufficient for the industry to face the competition from abroad and the industry will occupy its legitimate place in the post war reconstruction schemes.

2—BELTING INDUSTRY IN INDIA

India is on the threshold of freedom and post-war development of the country's resources presupposes progressively rapid industrialization.

Even if industrialization to that extent as in Europe and America may not be desirable for a primarily agricultural country like India, there is no doubt that an adequate balancing of agriculture by industry is desirable.

In the future plan of industrial development, Belting Industry has an important place. All modern industries require transmission of power and the usual and most convenient method of taking power off shafting is by means of belts running on pulleys.

A simple technical exposition of belting and its use will not be out of place here. The faces of the pulleys are very slightly rounded, the longest diameter lies in the middle for use with plain beltings and this device keeps the belt in position.

The ratio of the sizes of the diameters of driving and driven pulleys should not exceed six to one and the distance between the pulleys should be such that the arc of contact of the belt on the smaller pulley is never less than 150 degrees, greater if possible. Vertical or steeply inclined belts should be avoided.

Leather belting was and is still the most commonly used belting, though cotton beltings of various types, plied, solid-woven, rubberised or painted and Hair beltings have more and more come into use.

The speed of beltings which is practically equal to the rim of the revolving pulley is an important factor as the bigger is the size of the rim the greater is the power that can be transmitted.

A limit is set to this, however, by the action of centrifugal force, which renders it undesirable to employ a speed higher than 5,000 ft. per minute. When the power is greater, stronger and thicker belts are used. The power transmitted is proportionate to the difference in tension between the two sides of the belt and

the tight side is subject to about twice the tension of the slack side. The weakest part of a belt is the joint; allowing for this, the safe working tension in the tight side is 300 lbs. per square inch of the cross section of the belt.

Beltings generally used for transmission of power are flat Belts, leather and woven. V Beltings are new innovations with which for greater frictional surfaces in the grooved pulleys, very short drives have been possible and therefore V belts are used mostly for individual motor drives.

Of flat belts, leather belts are very good for pliability. But the draw-back for leather beltings lies in the weak joints. Leather belting industries have not been much developed in any organised way. The demand for leather beltings in India in pre-war days could not be higher than 200 Tons and the present demand can be safely assumed to be about 500 Tons. If good tanneries in India take up manufacture of leather beltings on scientific lines, much of Indian money can be kept in India with greater employment of Indian labours.

Of woven flat beltings, the strongest, though not as pliable as leather or cotton beltings, are Hair Beltings. Many people think that Hair Beltings are Camel Hair Beltings. This misconception is due to the camel brand of a particular manufacture. Indeed, there are not so many camels in the world as to meet the demand of Hair Beltings. The Hair yarns are worsted sheep wool yarns. The sheep wool is mostly Australian, spun in U. K. or woollen mills in India. Abundant wool of quality is available in India, particularly Tibetan wool in Kalimpong. But for want of scientific sorting, these wools are either used only for manufacturing blankets of loose spun yarns or exported. A small unit of wool spinning mill with minimum capacity of manufacturing one lakh pounds of wool yarns per month is not uneconomical and will be most welcome to Hair Belting industry in India.

We have in India, four belting factories, namely The Bengal Belting Works Ltd., Messrs. Birkmyre Brothers Ltd., India Belting & Cotton Mills Ltd. and Hindusthan Belting and Spinning Mills Ltd. The first Belting factory situated in India is Messrs. Birkmyre Brothers. The second which is the biggest is the Bengal Belting Works Ltd. Both are long pre-war

belting industries. The India Belting and the Hindusthan Belting have been started during war. All the four Factories are situated in Serampore in the District of Hooghly, Bengal. All the four companies manufacture Hair and Cotton Beltings. The Bengal Belting Works Ltd. and Messrs. Birkmyre Brothers manufacture Rubberised Beltings. These indigenous Rubber Beltings are solid woven, rubberised on the surface and different from the imported Rubber Beltings in the fact that in case of the latter, the plies are stuck together by rubber only whereas in the indigenous Rubber Beltings the layers are solid woven by binding the plies with binders in the weaving itself. Indigenous Rubber Beltings are stronger than plied foreign rubber beltings. Cotton beltings are also solid woven painted with bituminous oil paints.

In absence of statistics, it is difficult to correctly estimate the import figure of beltings. In pre-war days the total annual import of beltings including Leather, Hair, Cotton, Balata and Rubber Beltings could not be more than 1,500 Tons and of value Rupees Fifty lacs. With growth of Indian industries, the demand for beltings is rising and the present demand is roughly estimated at 2,000 Tons. The capacity of production of the four Belting Factories for woven beltings is about 1,500 Tons. Deducting demand of Leather Beltings as 500 Tons, the capacity of indigenous production is adequate to meet Indian demands. But, owing to factors beyond control, such as scarcity of Hair and cotton yarns, and occasional labour unrest, production falls below the programme.

In our post-war industrial development, it will be met if industrialists co-operate with indigenous belting manufacturers by giving full trial to indigenous beltings and guide the manufacturers to improve their quality of beltings to suit the special requirements of Indian industries and climatic conditions of different provinces. It is also a duty of the Government to help the indigenous belting manufacturers by test laboratories and researches. Although no-body should deny that scope for improvement is enormous, none should think that indigenous beltings are inferior to foreign beltings.

During the war, it is these indigenous belting manufacturers who have kept all Munition factories, Railways, big and small

industries running without feeling dearth of beltings for power transmission. Now that the war is over, there are many conservative minded consumers and upatriotic indentors who look again for foreign supply. But, if there be another war, India will have to depend on her indigenous beltings for various industries and factories. India should be independant of foreign supply in respect of her requirement for beltings and it is the duty of both the Government and people of India to see that these belting industries are not only protected against foreign dumping, but develop further and further to meet ever increasing industrial needs in India.

3—BICYCLE INDUSTRY

Introduction.—The Cycle Industry in India is an outstanding example of the establishment of an indigenous industry with indigenous labour, capital and management. Before the war, the entire Indian market was in the hands of foreign manufacturers, chiefly British and Japanese who were so firmly established and whose brands were so well-known and popular in the country that any attempt to compete with them from within or without was destined to meet with failure.

History of the Industry.—The cycle industry is of very recent origin. In 1938 the India Cycle Manufacturing Co., Ltd., Calcutta ordered for some cycle manufacturing machinery but before they could get delivery of the machinery the second world war was declared with the result that they had to be content with manufacturing some accessories and component parts of bicycles instead of complete cycles. Then in 1939 Messrs. Birla Brothers Ltd. one of the leading business houses of the country launched a programme of establishing a cycle factory at Bombay. Although their plans were complete before the out-break of the war, it was up-set due to the war and it was in 1940 that they began to receive the ordered machinery. The manufacture of parts was taken in hand the same year. The actual production of complete cycles commenced in the year following.

Another factory *viz.*, The Hindusthan Bicycle Manufacturing and Industrial Corporation Ltd., for the manufacture of complete cycles was started at about the same time at Patna in the province of Bihar. This company commenced production in 1942. Both these companies manufacture complete bicycles and make in their own factories all the parts except freewheels, chains, and ball bearings which are imported from abroad. The Hindusthan Bicycle Manufacturing and Industrial Corporation has started manufacturing spokes and is making experiments for the manufacture of freewheels. The Indian cycle industry although originally planned to produce bicycles for civil consumption had to switch over to war production for defence purposes at the out-break of the war. As these companies happened to put up their factories on the eve of the war, they met with great difficulties in getting proper machinery, tools, raw materials and

really good experts. Inspite of these difficulties the industry proved its worth during the war.

Location of the Industry.—The Indian Cycle Industry is very favourably situated from the point of view of locational dynamics. The Hind Cycles Ltd., and the India Cycle Manufacturing Co., Ltd., are situated at two of the important parts and business centres of India. The raw materials required by the industry are available locally excepting few parts which have to be imported.

From the point of labour, the Calcutta and Bombay factories have got great advantages over the Patna factory as they are in the centre of engineering industries. The Patna factory has also now a band of trained workers.

The vast market of India is there. All the three factories are thus situated in a very favourable position regarding the market. The Patna factory, however, seems to have an advantage with regard to transport facilities so far as the northern Indian market is concerned and it may safely be said that northern India with its vast plain and agricultural and semi-agricultural population offers the best market.

Labour.—In the beginning the industry had to face many difficulties with regard to labour. But these troubles may be said to have been largely overcome by now. The mass of labour employed to-day is fairly skilled and some of the men have acquired skill to a high degree of efficiency. Speaking generally it may be said that the workmen now engaged have in a large measure adapted themselves to mass production of bicycles and precision work of requisite degree on machine tools. A portion of the labour force released from Ordnance factories and ammunitions manufacture will enable not only the supply to be kept up but a certain amount of expansion to take place without undue anxiety as to labour shortage.

Capital and Equipment.—This shows that industry is adequately financed. Moreover taking into consideration the future prospects of the industry and the strong houses of managing agents with which these companies are associated there shall not be any dearth of capital if more capital is needed.

The cycle industry in India has been established on the basis that the whole working plant in such sequence as it is operating on the continent of Europe and in the United Kingdom, has been brought out and set up as composite producing units. The equipment purchased has been new and of the latest type.

The Domestic Demand.—The following statistics will give an idea of the quantity and value of cycles entire or in sections and the value of parts of cycles and accessories (excluding tyres) imported into India since 1936-37.

Year	Quantity of cycles.	Value of cycles.	Value of parts and accessorie.
		Rs.	Rs.
1936-37	1,59,450	45,10,000	61.47,000
1937-38	1,70,664	55,74,661	62,79,646
1938-39	1,38,036	48,19,368	47,89,335
1939-40	92,249	33,29,100	41,04,975
1940-41	50,222	22,19,179	30,14,946
1941-42	54,445	26,00,618	31,53,804
1942-43	16,134	9,73,595	17,29,920
1943-44	28,355	18,82,365	21,16,730
1944-45	37,391	25,15,713	29,44,265
1945-46	76,141	54,77,205	not known

These imports came mainly from the United Kingdom, Japan and Germany. Of these competition from Japan and Germany is more or less extinct and the only country from which imports are likely to come is the United Kingdom. In the years preceding the war the largest figure of imports of cycles was a little over 1,70,000 entire or in sections. In addition to

these cycles entire or in sections, cycle frames are imported in large quantities and these are assembled into entire cycles in India. If this factor is also considered the actual imports of cycles will be increased by another 30,000 and thus making the total imports of approximately 2,00,000 cycles for 1937-38. It is interesting to note that the value of parts and accessories imported invariably exceeded the value of cycles imported entire or in sections.

Before the war the entire demand was met from imports. During the war, however, the number of cycles imported into India was progressively on the decline. The domestic production was hopelessly small. The normal demand, therefore, has not been met by adequate supplies during the war-years. In the meanwhile total demand of the country has considerably increased due to wartime increases in incomes. Taking these factors into consideration the Tariff Board have estimated that the total demand in the next three years shall be more than 6,00,000 per year. In view of the low initial cost and the cheapness of running a bicycle, there is very substantial untapped market for bicycles in India waiting for enterprising Indian industrialists to supply.

Domestic Production.—According to the information supplied by the manufacturers to the Tariff Board the rated capacity of the Hind Cycles is 60,000 cycles per annum and of the Hindusthan Bicycles Manufacturing and Industrial Corporation is 35,000 cycles per annum. India Cycle Manufacturing Co. has the capacity to produce spares and accessories of the value of approximately Rs. 3,50,000 per annum. This rated capacity has actually not been realised by the industry. In 1945 the actual production of the Hind Cycles was 25,000 cycles and of the Hindusthan 19,000 cycles. As a result of expansion that has already taken place and that is taking place, it is expected that the Indian capacity will soon reach a figure of over two lakhs of cycles per year.

Raw Materials and their supply.—The raw materials required for the cycle industry are:—

(*a*) Steel-tubes or steel strips for making tubes, steel sheets, steel bars, mild steel and spring steel wires.

(*b*) Ready components—free wheels, chains, steel balls and spokes.

(*c*) Rubber parts—tubes, tyres, handlegrips, pedal rubbers and brake rubbers.

(*d*) Consumable stores—high-speed steel, die-steel, nickel anodes, colouring, brazing and electroplating materials.

(*e*) Accessories—lamp, carrier, stand, bell, pump, tool-bag and reflector.

Except steel strips and tubes, the other categories of steel are available in India. Similarly other raw materials are also available. The only items for which India has to depend upon imports are chains, free-wheels and ball bearings.

Protection.—For protecting the industry the Tariff Board have recommended as follows:—

(*i*) the existing *ad valorem* duty of 24 per cent. should be converted into a protective duty at the same rate to remain in force till the 31st March, 1949. If the total landed cost of an imported bicycle inclusive of duty goes below Rs. 109 during the period ending 31st March, 1948, and goes below Rs. 100 during the period from the 1st April, 1948, to 31st March, 1949, action should be taken under Section 4(1) of the Indian Tariff Act of 1934 to raise the duty so as to make the landed cost inclusive of duty of a bicycle Rs. 109 during the first period and Rs. 100 during the second period. The cycle referred to is the standard gents' bicycle with 24 inches frame without any accessories;

(*ii*) in the Tariff Schedule cycles and spare parts should be shown separately under the categories (*a*) cycles (other than motor cycles) imported entire or in sections, (*b*) cycle frames, (*c*) handlebars for cycles, and (*d*) all other parts and accessories of cycles not otherwise specified (excluding rubber tyres and tubes);

(*iii*) the Steel Controller should give special facilities for the manufacture and supply by the Indian steel manufacturers of the steel required by the cycle industry;

(*iv*) it should be made a condition of the grant of protection that the cycle industry should actually spend or set apart specified amounts for research;

(*v*) the import duty on machinery imported for the manufacture of cycles should be refunded;

(*vi*) bicycles required by the departments of Government, both civil and military, should be purchased from indigenous manufacturers.

The Government of India have accepted recommendation (i) and have decided to replace the existing standard rate of 36 per cent. *ad valorem* and preferential rates of 24 per cent on manufactures of the U. K. and 12 per cent. on manufactures of Burma by protective *ad valorem* duties of 36 per cent., 24 per cent and 12 per cent. respectively. These protective duties will remain in force till the 31st March, 1949. Appropriate action under section 4(1) of the Indian Tariff Act, 1934, will be taken if the c.i.f. prices of the imported bicycles fell below the levels indicated in paragraph 2(i) of this Resolution.

Government have accepted recommendations (ii) and (iii) and necessary action is being taken to implement them.

The Government of India attach great importance to recommendation (iv) and expect that each of the Indian manufacturers will spend or set apart for research in a separate fund a sum of not less than Rs. 50,000 in the year 1947 and Rs. 70,000 in the year 1948. Government reserve the right to withdraw the protective duties agreed to in paragraph 3 above if the industry fails to set aside the amounts specified for research.

Recommendation (v) will be considered along with the general proposal for remission of import duty on machinery which is under the consideration of Government. With regard to recommendation (vi) Government consider that this is sufficiently covered by the orders already in force in regard to purchase of bicycles by Government Departments.

4—GRINDING WHEELS INDUSTRY

Introduction.—In the schemes for the industrial regeneration of the country every sector of economy should be fully developed. An all round industrial development is the true criterion of industrial progress. In the haphazard industrial development of the country no or little attention was paid to the basic industries. The result was the growth of industries like growth of trees without roots. It is encouraging to note that architects of new India are rectifying the errors committed in the past. Here we are giving a brief survey of Grinding Wheels industry—an industry which has got an important place in the national economy. The demand for Grinding Wheels is a good index of the general industrial activity of a country. The importance of the industry can be realized by the fact that it has received careful attention on the hands of the Tariff Board whose report has been recently published.

Uses of Grinding Wheels.—Before we deal with historical growth and other allied topics it would be interesting to note the uses of Grinding Wheels. As pointed out in the Report of the Tariff Board Grinding Wheels are mostly required for grinding iron and steel and materials made thereof. Consequently, the biggest users are the railways, tool, machine, automobile and ship-building factories and foundries. Grinding Wheels are also required for grinding non-metallic materials. They are further used for a large variety of work such as tool and cutter sharpening, cylindrical grinding, roll grinding, general and surface grinding, grinding of cereals, starch, flour etc. Many different kinds of grinding wheels are required for different purposes in factories.

Historical Development.—The histiory of grinding wheels industry dates back to the years just before the declaration of the Second World War. As a matter of fact the history of grinding wheels industry is the history of only two firms *viz.* Messrs. Grindwell Ltd., Bombay, a partnership firm and Messrs. Kata Grinding Wheel Works, Amritsar. Grindwells were established just before the outbreak of the war with the technical assistance of two refugee Czechoslovakian Engineers. Owing to abnormal difficulties created by the war the Grindwells could not proceed with their production on any

appreciable scale. On making an approach in 1941 to the Department of Supply some assistance was promised by the latter. So full scale production by the firm started only in 1942. On account of the higher cost of production the Government could not patronise the firm in the beginning. The main reason to rely on Grindwells arose from Government's inability to enter into forward delivery contracts with importing houses. The importers under their panel import quotas imported the particular sizes and types of grinding wheels and consequently did not put into stock such sizes for railways and other Government Departments as might not have a quick turnover. Grindwells were, therefore, called upon to supply special sizes. Government also agreed to render all kinds of assistance which were sought for and which under the existing circumstances could be given. This is the chief reason for Grindwell's expansion up to February 1944. After this date control of imports was stabilised and Grindwells experienced a tapering off of Government orders and asked for protection.

The other firm, *viz.*, Messrs. Kata Grinding Wheels Works started production in 1943 on the basis of their experience of the Ceramic industry in other lines, chiefly highgrade porcelain insulators etc. Grinding Wheels produced by this firm are of simpler types. But as a result of research carried on by it and due to financial and technical support by the Punjab Government, the firm has evolved a technique which is particularly suited to the raw material found in India. Government has also helped the firm in procuring coal, tools, lend-lease lorries for transport and technical advice and in obtaining prospecting and mining rights in Rewa State.

Estimated Demand and Domestic Production.— As pointed out before the demand for grinding wheels is a good index of the general industrial activity of a country. United Kingdom was the most important country in the pre-war days from where entire demand was met. It has been estimated that 40 per cent. of the total demand comes from Government and Government Ordnance factories and 60 per cent. from industry. It has also been estimated that pre-war quantum of import was

in the neighbourhood of 330 tons per annum. The figures for total demand in 1943, 1944, and 1945 were as follows:—

—	1943 (tons)	1944 (tons)	1945 (tons)
Imports ...	400	460	300
Sales by Grindwells ...	101	144	172
Sales by Katas ...	10	15	15
TOTAL ...	511	619	487

The total value of consumption for the respective years was as follows:—

	Rs.
1943 ...	22,45,310
1944 ...	26,05,333
1945 ...	16,59,166
Average per annum	21,69,935

It would not be safe to put the total Indian demand during the next three or four years at a higher figure than 300 to 350 tons per annum which was the pre-war average. After the exit of the transitional period when post-war reconstruction schemes are in operation it would not be too optimistic to expect the demand go up by 50 to 100 p.c. over the present demand.

So far as the domestic production is concerned we have already pointed out that there are at present only two factories producing grinding wheels, namely Grindwells and Katas. Grindwells use synthetic abrasive grain which is the most important raw material and of which large quantities were imported during the war from the United States under lend-lease. The other raw materials namely, fire, clay, pipe clay, magnesite, plaster of Paris and silicate of soda are obtained from indigenous sources. Katas use only Indian corundum and banding materials. Their supply of corundum is obtained

under their own mining rights from the Rewa State and crushed in their own factory at Amritsar. They do not depend on imported materials.

For the production of high quality wheels synthetic abrasive grains are essential. The manufacture of sythetic grains is a highly specialised industry in itself and its success depends on the availability of very cheap electricity. Until these grains are produced in India the manufacturers of grinding wheels in India shall have to depend on imported synthetic abrasives.

Katas, who use for their raw material corundum of Indian origin, have so far produced small quantities within a limited range. The technical research which they are carrying on indigenous raw materials with the financial and technical assistance of the Punjab Government is a good index to their progress in the future. This industry is a rather highly technical one. Consequently much of its success depends on competent technical advice, supervision and guidance.

Quality of Indigenous Wheels.—As regards the quality of Indian grinding wheels it is encouraging to note that, it is as good as that of the imported materials.

Recommendations of the Tariff Board (1946-47).— The recommendations are summarised as follows:—

(1) No new licences for the import of grinding wheels and segments, oil stones, sharpening stones, etc., should be issued for the remainder of 1946 (paragraph 38 of the report).

(2) A protective import duty of 80 per cent. should be levied on all articles covered by the category "grinding wheels and segments" for a period of three years with immediate effect, and a separate heading should be created for the same in the customs tariff schedule. (Paragraphs 40-41).

(3) If the c.i.f. prices of grinding wheels fall below the estimated current c.i.f. prices by 10 per cent. or more, action should be taken under section 4 of the

Indian Tariff Act of 1934 and the duty should be so adjusted as to maintain the measure of protection recommended by us (paragraph 39 of the report).

(4) The existing concession in favour of Grindwells to import synthetic abrasive grains free of customs duty should be continued for the entire period of protection and be extended to other manufacturers of grinding wheels in the country (paragraph 41 of the report).

(5) All Railway and Government orders for grinding wheels should be placed with the Indian manufacturers up to the limit of their productive capacity (paragraph 42 of the report).

The Government of India have passed the following orders on the above recommendations:—

The Government of India have carefully considered the Board's recommendations and feel that in view of the figures quoted by the Board in paragraph 37 of its report the industry is not likely to survive even with as high an import duty as 80 per cent. Large stocks of grinding wheels are also reported to be accumulating in certain foreign countries, the surplus of which might easily be exported to India at prices uneconomic from the point of view of indigenous manufacturers. Government are of the view that the industry should be given direct protection and have, therefore, arrived at the following conclusions on the Board's recommendations:—

(*i*) All imports of grinding wheels would be prohibited throughout the financial year 1947-48, except for qualities which cannot be produced in India.

(*ii*) A duty of 50 per cent, would be imposed on the special qualities of grinding wheels which cannot be produced in India.

(*iii*) A duty of 50 per cent. would be imposed in regard to varieties manufactured in India when it is decided to lift the prohibition on their imports.

(*iv*) Government accept recommendation (3) contained in paragraph 2 above and necessary steps will be taken to give effect to it.

(*v*) The Government of India also accept recommendation (4) and the Railway Board, M. G. O. and other Government agencies are being instructed to obtain their requirements of grinding wheels from indigenous production subject to satisfaction as to quality.

The Government of India are of the view that industries coming up for state assistance shoulld be in the hands of public limited companies and have, therefore, decided that the protection granted to the grinding wheels industry in this Resolution shall be subject to the condition that the two concerns now engaged in the manufacture of grinding wheels *viz.* Messrs. Grindwell Limited, Bombay, and Messrs. Kata Grinding Wheel Works, Amritsar, should take early steps to convert themselves into public limited companies.

The grant of protection is also subject to the condition that the agreement reported to have been arrived at between the foreign and Indian shareholders in Messrs. Grindwell Limited, whereby the former had agreed to transfer their shares to the latter and the latter had agreed to take them up, is carried out at an early date.

Conclusion.—In the end we wish to emphasize certain points. In order that the Indian producers may improve their process and reduce their costs, it is necessary that they should be able to secure a minimum amount of sales in the market. For this purpose the Tariff Board recommend that all railways and Government orders should be placed with the home manufacturers up to the limit of their capacity. This will enable the producers to achieve some stability of production in the face of declining demand and also to overcome the prevalent prejudice against their products which is found to be fairly widespread among certain sections of the engineering industry in India.

5—HURRICANE LANTERN INDUSTRY

Introduction.—The Hurricane Lantern Industry furnishes, among others, a very good example of the contribution made by the war to the growth of Engineering Industry. Hurricane lanterns are an essential household requirement greatly in demand both by the rich and the poor in places where electricity has not been provided. Even where electricity has been provided hurricane lanterns are kept to meet for the contingencies of electricity failure or other troubles. A country which abounds in rural areas and where the provision of electricity is hopelessly inadequate a lantern is an object of daily necessity of life. Further hurricane lanterns are greatly in demand by the Defence Department, Railways and certain other departments of the Central Provincial and State Governments.

Short History of the Hurricane Industry.—In the history of the development of the Hurricane Lantern Industry, the year 1925 is an important land mark because it was in that year that the management of the Messrs. Ogale Glass Works Ltd., in the Aundh State of the district of Satara started a metal section in their glass factory for the manufacture of lanterns from iron and tin sheets.

A short history of this company will make an interesting reading as it wil give an idea about the early history of the industry.

Starting at a time when the boom effects of the last great war were just over the firm of Messrs. Ogale Glass Works started manufacture of lanterns with a capital of 4 lakhs of rupees with the productive capacity of 1,000 lanterns per day, but this capacity has never been fully utilised owing to various difficulties such as competition from abroad in the pre-war period and absence of raw materials in war time. Due to the bid for commercial supremacy in the Indian market by the exceedingly powerful foreign manufacturers for about 15 years (*i.e.* from the very start up to the beginning of the world war II) the Company had to face the deadliest competition. Germany the vanquished nation of 1914 world war which was not allowed to open trade relations with India came out in the Indian market with such a great dump of its lanterns that lanterns

which used to be marketed at Rs. 21/- per doz. prior to 1914 came out to be sold at Rs. 10/12/- per dozen in 1925.

In 1929, in the month of September England went off the gold standard and consequently the prices of lanterns which were quoted in Sterling pounds began to be quoted in American dollars and appreciated. That gave a ray of hope and the next three years enabled the firm to wipe of the past losses. But all did not seem well in the field of foreign exchanges; when America saw that Germany was having a major portion of the trade in Lantern Industry she depreciated her dollars and the American Deitz Junior Lanterns which used to be marketed in India at Rs. 19/8/- per doz. came down to Rs. 11/8/- per doz. in one night. In the absence of any counter move by the Government of India the firm was unable to do anything in bringing down its selling prices. From 1933 to 1939 the firm fared very badly. The work became so slack that in the plant capable of producing 1,000 lanterns a day, the firm could make only two lanterns a month.

The second manufacturer to enter the field of production of hurricane lanterns was the Oriental Metal Industries Ltd., Calcutta, which commenced production in 1936. With the outbreak of war, this concern came under the control of the Government of India to supply the stores required for the Defence Services. Only recently the control has been withdrawn and the production of hurricane lanterns for civilian use was undertaken. The war has, however, given an opportunity for the growth of indigenous industry when other manufacturers have sprung up mainly as a result of the stimulus supplied by the war-time scarcity of hurricane lanterns.

RAW MATERIALS

(1) *Tinplates or terne-plates or P. C. R. C. A. Mild Steel Sheets.*—The body of the lantern is made out of this material. The best raw material is tinplate but its supply is very scarce, hence the next best material *i.e.* terne plate is used. But even the latter is not available in sufficient quantity so the lantern manufacturers have to depend upon P. C. R. C. A. Mild Steel Sheets.

(2) *Brass Sheets.*—This material is required for making the gears for sliding the wick in the burner.

(3) *Galvanized and Steel Wires.*—These are wanted for making the lantern handle, the guard for the chimney and spring for holding the globe in place.

(4) *Solder.*—It is used to make the joints leak-proof.

(5) *Paint.*—Where terne plate or black sheets are used for making the body of lanterns, either tining or painting has to be resorted to.

(6) *Wick and*

(7) One Glass Globe to each lantern.

Extent of Demand.—Before the war a major portion of the requirements of the country in respect of hurricane lantern was met from imports. Therefore an idea of the total quantity of imports per year will give an idea of the extent of demand. The following figures show the quantity of imports of lanterns of all types.

Statement showing the Import of Metal Lamps.
(In Lakhs)

Name of the Country	1936-37	1937-38	1938-39	1939-40	1940-41	1941-42
1. U. K. ...	0·41	0·29	0·50	0·12	0·07	0·01
2. Hongkong ...	0·15	0·32	0·06	1·16	2·02	3·74
3. Sweden ...	0·30	0·18	0·14	0·12	...	...
4. Germany ...	39·73	53·31	23·10	16·79	0·03	...
5. Austria ...	0·76	1·02	0·51	0 31	...	...
6. Hungary ...	0·06	0·42	0·15	1·66	...	...
7. Japan ...	2·13	1·82	0 47	0·47	0·73	0·10
8. China ...	0 13	0·29	0·03	0 32	2·53	4·30
9. U. S. A. ...	2·93	2·91	2·46	3·55	3·51	4·75
10. Other Countries ...	0·06	0·08	0·04	0·05	0·17	0·04
TOTAL IMPORTS ...	43·04	60·64	27·46	24·55	9 06	12·94

A perusal of the statistics of imports, given above, will show that over 60 lakhs of metal lamps and lanterns used to be imported from abroad and Germany was the chief exporting country. It has been estimated that 80 and 90 per cent. of these imports were hurricane lanterns. It follows that 45 lakhs to 50 lakhs of hurricane lanterns used to be imported before the war and represented our annual consumption. In their recent investigation the Indan Tariff Board estimate that the country would require something like 60 lakhs per annum taking into consideration both the pent up or carry-over demand and the higher purchasing power consequent upon war-time prosperity.

Domestic Production.—During the course of our description of the early history of the industry we saw that Ogale Glass Works Ltd., was the only firm in the field of hurricane lantern industry up to 1936. In that year the Oriental Metal Industries Ltd., Calcutta commenced operation. But in the face of severe competition and the difficulty in acquiring raw materials the domestic production had perforce to be kept at a very low level. Since the commencement of the war, however, domestic production has shown considerable improvement. There are to-day as many as eight important manufacturers of hurricane lanterns in the country and the total rated capacity stands at 17·52 lakhs per annum. This figure is made up as follows:—

	Name of Manufacturer.	*Rated Capacity lakhs.*
1.	Ogale Glass Works Ltd., Ogalewadi ...	2·40
2.	Oriental Metal Industries Ltd., Calcutta ...	4·22
3.	India Industrial Works Ltd., Howrah ...	6·00
4.	Jay Engineering Works Ltd., Calcutta ...	3·00
5.	Bihar Lantern Factory, Dumraon, E.I.R. ...	1·20
6.	Raghu Engineering Works Ltd., Delhi ...	0·60
7.	Eastern Hurricane Lanterns Mfg. Co. Ltd., Calcutta	not known
8.	Metal Container and General Works, Delhi	do
	Total ...	17·52

It has been reported that a firm under the name of Indo-Scottish Engineering Co. Bombay has definite plans for putting up a factory with a productive capacity of 6 lakhs of lanterns a year. Thus taking into consideration the productive capacity of all the firms already working and the one to be started the total productive capacity is far short of the demand of the country although very encouraging improvement has been made by the industry during the course of four or five years. Even with rapid electrification of the country the demand for hurricane lanterns will remain at a high figure as with a rise in the standard of living hurricane lanterns will be demanded more and more in the country side. Every home will need a hurricane lantern and most homes more than one.

The Problem of Competition.—So far as the imports are concerned they came mainly from the United States of America, the United Kingdom, Australia, Japan and China. Of these the United States of America and the U. K. should be seriously considered. There is no need of apprehension from the Chinese and Australian imports for prices are too high for the Indian market. Of the two remaining sources America will be the principal competing country as the landed cost of American lanterns is substantially lower than that of lanterns imported from the United Kingdom. The landed cost of the former is Rs. 39-1-7 as against Rs. 55-13-0 of the latter. So if there is any danger of competition in the post-war years it is from America. We shall, therefore, now consider the need for protection.

Recommendations of the Tariff Board.—After examining the case for protection to the industry the Indian Tariff Board have recommended that the existing revenue duty of 30 p.c. *ad valorem* should be converted into an equal protective *ad valorem* duty for a period of 3 years. It was assumed that effect shall be given to the recommendation as from the 1st of October 1946 in which case the period of protection will be due to expire on the 30th September 1949. This period might be extended till the end of March 1950 so as to coincide with the financial year 1949-50 for purposes of administrative convenience.

Besides, the Board have recommended some other measures of assistance. They are:—

(1) As there is still a big gap between the requirements of the country in the matter of hurricane lanterns and the productive capacity so far developed, it is recommended that Government should announce a concession of refund of duty paid on machinery imported from abroad for expansion, improvement as establishment of new hurricane manufacturing capacity in the country.

(2) The industry does not involve complicated processes but nevertheless is likely to benefit of it is afforded facilities for sending skilled personnel.............. to study latest methods of production with a view to improving the technique of production at home.

(3) Foreign exchange facilities should be given in cases where machinery has to be imported.

(4) Government should give every possible assistance in the procurement of the necessary raw materials so that the full productive capacity might be utilised, dependence upon imports may be minimised and reduction in the cost of production could be achieved thus increasing the competitive capacity of the home industry.

The hurricane lantern industry has, thus, in the opinion of the Board qualified and deserves protection. It is encouraging to note that the Government of India have ratified the recommendations of the Tariff Board. Now that the protection sought for by the industry has been granted it is expected that industry will develop considerably.

6—PIPES AND TUBES

Pipes and tubes include three different categories which may be discussed under separate headings. First of all we shall devote ourselves to hume pipes.

(1) HUME PIPES

Hume Pipes known after the Hume process by which they are manufactured are essentially of two kinds, *viz.* (i) pressure and (ii) non-pressure. High pressure Hume Steel Pipes which have a diameter up to 48″ and are manufactured in shells from 1/8″ to 1/4″ thickness are required for water supply.

Uses.—The uses to which hume pipes are put are many. They are specially used for culverts, irrigation and drainage, urinals, latrines, septic tanks, dust lines, water storage tanks etc.

Raw Materials required.—For the manufacture of hume pipes we require cement, steel plates and rod.

Owing to excessive demand and inadequate supply there has been a shortage of steel, therefore cast-iron and other substitutes have been used.

Chief Producers of Hume-Pipes and their turn over.—The production of hume pipes was started in 1926 when the Indian Hume Pipe Co. first turned out a large number of pipes. The company soon expanded its business and by 1941 it came to own 35 factories spread all over the country.

When the war commenced the Supply Department of the Government of India placed an order for the supply of 300 miles length 8″ Hume steel pipes. Obviously placing order for such a huge supply of Hume-pipes necessitated the installation of a new plant. This being done the production capacity reached the figure of ½ mile length per day.

In order that the company may be self-reliant in the matter of wire and rods and the machineriy required for producing Hume pipes it took necessary steps. The company put up an electric steel furnace and a rolling mill to produce wire and rods. Further the company installed necessary plants in the workshops of Bombay and Jamshedpur where almost all the machinery required in the pipe factory are manufactured.

The present production capacity of the Indian Hume Pipe Company can be judged from the following annual turnover figures:

Turnover of the Indian Hume Pipe Co.

	Rs.
1926-27	67,503
1938-39	33,94,242
1942-43	68,00,000

The other firm which is engaged in the production of pipes is The Gurjrat Sanitary Engineering Company, Ahmedabad. The capacity of the firm however is very limited.

Post War Prospects.—The future industrialization, of country and other developmental programmes there will be greater demand for Hume pipes. At present the production is retarded owing to inadequate supply of steel and cement. If the Indian Hume Pipe Co. is assured of the regular and adequate supply of these raw materials the Company alone may be able to produce enough to satisfy the entire demand of the country.

(2) CAST IRON PIPES

Introduction.—Cast iron pipes are also of 'pressure' and 'non-pressure' types. The pressure pipes are required for water drainage and sewage lines and the non-pressure pipes are used for rain water conveyance and for soil and sanitary services. The Cast Iron pipes are very durable; they are impervious to corrosion and rust.

Historical Growth and the Present Producers.—So far as the production of non-pressure pipes is concerned they have been produced by many firms scattered all over India for a long time. But the production of pressure pipes and fittings is confined chiefly to the following firms:

(1) The Indian Iron & Steel Co., Kulti.

(2) The Musore Iron & Steel Works, Bhadravati.

(3) The Tatanagar Foundry Ltd., Tatanagar.

In the years preceding the declaration of the War II the firms taken together produced on an average 13,500 tons a year. During the war the demand for cast iron pipes increased for three reasons. Firstly, steel pipes which used to be imported formerly could not be imported now. Secondly, a large number of water supply schemes which had to be undertaken as war emergency measures necessitated the production of large quantities of cast iron pipes. Finally, cast iron pipes had also to be sent to the Middle East. As a consequence of these the production of cast iron pipes increased to an annual figure of 40,000 tons per year—more than three times the prewar figure. Inspite of this increase the production proved to be inadequate and to get over the difficulty the Indian Iron and Steel Company installed a new plant with an annual capacity of about 25,000 tons.

There are many small firms who manufacture cast iron pipes of pressure and non-presure types. During the war when the supply position became distressing these small firms were also asked to produce whatever quantity they could. But owing to the raw material difficulty and also the transport hindrance the production by these scattered firms did not prove an economic proposition. It was only in 1944 when the export of cast iron pipes to the Middle East stopped and also import of steel pipes from U. S. A. was secured under Lease-Lend arrangements that the supply position improved.

In the years to come cast iron pipes will be needed in large quantities. Provided the present big firms are assured of the raw materials and the small firms are properly organised and their raw material and transport difficulties solved there is no reason to believe that the entire demand of the country will not be met lecally.

(3) STEEL TUBES

Introduction.—Like Hume and Cast Iron pipes Steel tubes are an essential requirement of daily life. They are used for house water connections and for the conduct of gas and steam and other liquid gasses. Tube Wells are very common in India, steel tubes are used in these wells also. Further steel tubes are used for light constructional purposes.

Early history and present position.—Steel Tubes were made even before the war. But the total production amounted to only about 3,000 tons per annum while the total demand was in the neighbourhood of 30,000 tons. The Chief Producer in those days was the Indian Tube Company, Calcutta. The industry required steel strip which had to be imported. After sometime the Indian Tube Company made an arrangement with the Tata Iron and Steel Works and Stewart Lloyds whereby the Tatas were to supply the necessary steel. It was decided to set up a new factory named the Tata Works at Jamshedpur. The Company was to be brought into existence in 1939 but the Government intervened in the meantime stating that Tatas should not embark on the new venture in the then existing circumstaínces.

Just after the declaration of the war Indian Tube Company had to close their plant but on the request of the Government they started production. In 1943 they produced in the neighbourhood of 10,000 tons. After some time again they had to close down the works because of the import of steel pipes instead of steel rods from the U. S. A. under Lend-Lease Agreement.

So far as the future is concerned if the Tatas Works are started at Jamshedpur they together with the Indian Tube Company can meet the future demand of the country.

7—SCIENTIFIC INSTRUMENTS

Introduction.—Nearly all the colleges, hospitals and research institutions are very well acquainted with the supremely fine and delicate instruments. Only several years of experience and a highly developed skill and carftsmanship can produce these instruments. In their manufacture a wide variety of raw materials are required and most of these items are non-ferrous which have to be imported from abroad.

Historical Development.—The industry is only of recent origin. Before the outbreak of war India had no Scientific Instruments Industry in the true sense of the term. There were a large number of firms which were producing simple instruments and apparatus. Production was carried on on a very small scale. It has been estimated that the indigenous production could satisfy only 5 per cent. of the home demand.

The outbreak of war brought in a new era. As in other cases, foreign supplies of Scientific Instruments were also cut off. The indigenous sources had to be modernised and a number of maintenance workshops and a few purely manufacturing workshops producing Scientific Instruments came into existence. Together with many other types of instruments the production of laboratory glassware, which is directly associated with the production of Scientific Instruments and Apparatus expanded to a considerable extent during the war years.

Chief Producers.—Of the firms producing simple types of Scientific Stores and drawing instruments in the pre-war days the following may be noted as the chief producers:—

(1) P. Orr & Sons, Madras,

(2) Lawrence & Mayo, Bombay,

(3) Balance Works, Benares, and

(4) National Emporium, Roorkee.

In addition to these pre-war producers the name of the Mathematical Instruments Office, Calcutta, may be noted with special reference. This is a Government factory under the Department of Education, Health and Lands, employed mainly on the production and repair of Scientific Instruments for the Survey of India. During the war it was felt necessary to enlarge

and convert the Mathematical Instruments Office into an ordnance factory. Simple stores like drawing-boards, stands, instruments, sun compasses, etc., which were manufactured by the M. I. O. were now produced by private firms. This transfer of production gave an opportunity to the Mathematical Instruments Office to devote itself whole-heartedly on the production of more important stores, such as, binoculars, prismatic compasses, sighting telescopes, etc. It has been found out that this one factory produced more than all the other firms put together.

The number of firms manufacturing Scientific Instruments increased to 160. But very few of them were equipped or competent for the manufacture of complete Scientific Instruments. Most of the firms, over 150 in number, should be regarded merely as Sub-Contractors for the production of small mechanical components.

So far as location of these firms is concerned one thing is worth noting. Bengal has as many as 100 firms and of these 95 are situated in Calcutta. The concentration of the industry in and around Calcutta is not advantageous as climatic conditions in Calcutta are unsuited for the work.

Rationalization of the Industry.—In the present set up of the industry one outstanding problem is rationalization and the first step that can be taken in this direction is to standardise the types of instruments produced and used in the country. In England and the U. S. A. organisations like National Physical Laboratory and the Federal Standards Bureau have been set up respectively to guide the firms so that they may not indiscriminately try to produce instruments irrespective of their types, quantities and demand. Curiously enough, in India, the users of these instruments after coming out of colleges or training institutions show a special prejudice for a particular type of instrument or apparatus in the handling of which they have been habituated. The work of rationalization should be directed in this respect also whereby the users must be guided in choosing the instruments and must be persuaded to use only standardized instruments of Indian make. At present the manufacture of scientific instruments is not an economic proposition. It can be a profitable business only when

standardized types are produced on a mass scale to meet the requirements of consumers whose demands have also been standardized. Obviously this means the elimination of weak and inefficient firms. If rationalization is conducted on these lines India can easily dispense with imports of simpler types of instruments. Import of complicated instruments may be necessary at least for some time to come.

Post-war Problems :—Besides rationalization the industry will have to face some other post-war problems. During the war practically the whole of the stores manufactured under the war expansion scheme were for war purposes. War having ended the question is how the war demand can be converted to civilian demand. Nearby 30 to 50 per cent. of the capacity employed during the war might be utilised for the manufacture of stores suitable for civilian use. If the industry is rationalized as suggested above, if the cost of production is reduced to marketable level and if the consumers' demand is canalised as stated above a considerable percentage of personnel employed during the war may be absorbed in the industry. Again some of the personnel may be employed in like industries such as bicycles, sewing machines, gramophones, clocks, watches etc. More technical experts shall be required if the Indian Manufacturers decide to produce cameras or sound film projectors etc.

Conclusion.—To conclude, in the wake of industrialization in the post-war years industrial research and scientific control of manufacturing processes will require a large number of instruments and apparatus which could be produced in India if only the industry is conducted on lines suggested above.

8—WAGON BUILDING AND ARMOURED VEHICLES

(i) Wagon Building

Introduction.—Necessity is the mother of invention. During the war when foreign sources of supply were cut off Indian Engineering Industry was called upon to undertake the manufacture of railway wagons and armoured vehicles. The building of railway wagons has been established since long. It involves two processes: structural and mechanical. In India most of the railway companies have their own replacing and repairing equipment. But so far, except for individual instances, none has specialised in the manufacture of new wagons.

The Chief Producers.—The four firms which have been manufacturing railway wagons are the following:—

(1) Jessop & Co. (Dum Dum)

(2) Bird & Co. (Howrah)

(3) The Indian Standard Wagon Co. (Burnpur)

(4) Braithwaite & Co. (Kidderpore)

It is, however, interesting to note that of these firms only the Indian Standard Wagon Co. (Burnpur) has specialised in the manufacture of wagons. The other three firms combine with it other engineering trades.

The total output of all these firms before the war was between 2,500 to 3,000 wagons per year. They had, however, the capacity of producing double the number actually produced.

Materials required and the position of their supply.—For the construction of wagons the following materials are required:

(1) Steel Materials, like structurals, plates, bars and billets, spring steels and rivets.

(2) Steel Castings and forgings.

(3) Wheels and axles.

(1) As regards steel materials, they are made chiefly by the premier iron and steel producers. In order to maintain an equitable distribution of the available supply and efficient co-ordination the Government has controlled these materials. The

greatest difficulty experienced under (1) has been with respect to rivets. Foreign suppliers being cut off during the war, they were badly needed. Production had to be undertaken here from rolled steel bars. The chief makers of rivets at present are Messrs. Guest Keen & Williams, Calcutta, Burn & Co. and Jessop & Co. Inspite of such steps being taken a large quantity of rivets has still to be imported.

(2) As regards the *Castings and forgings* they are at present manufactured by Messrs. Kumardhubi Engineering Works, Bhartia Electric Steel Co., Ltd. and Burn & Co.

Forgings are required for making drawer hooks, screw couplings, brake gear etc. Steel is forged from billets. Heavy forging is done by Indian Standard Wagon Co. and light forgings are made by Jessop & Co. and Burn & Co.

(3) As regards wheels and axles they were formerly imported but now Tata Iron & Steel Co., Ltd. have succeeded in making them by laying out a new plant. This special plant was brought into operation in 1941 with the help of which Tata Works have been able to produce acid steel. Further by applying the Triplex Process they have been able to undertake the manufacture of wheels, tyres and axles—essential articles for railway wagons, which had hitherto been imported from abroad. This new adventure by the Tata Works is affording a great relief to the wagon-building industry. It is, however, to be remembered that Tatas are unable to satisfy the entire demand and a considerable amount of wheels and axles has to be imported.

The Future Programme.—During the war the shortage of wheels and axles stood in the way of perfecting a programme for 10,000 wagons to be made by June 1944. Inspite of efforts on the part of Government imports could not be arranged for in time. Though Tatas have undertaken the production of wheels and axles, a considerable part of the demand remains unsatisfied. So long as the home supply is inadequate imports of materials required have to be made. The future policy regarding the wagon building is of great significance both from the point of view of Railways and the Engineering industries of the country.

II. ARMOURED VEHICLES

Armoured Vehicles play an important part in the mechanised war-fare. On the outbreak of war India had no firm manufacturing amoured vehicles. The foreign supplies being cut off Tatas undertook the manufacture of bullet-proof plating. But since supplies were inadequate American markets had to be tapped. Some difficulty was experienced in the fabrication of the bullet-proof steel. This necessitated the import of oxy-acetylene cutting plant. The remaining part of the manufacture of bodies of armoured vehicles, could be done by the engineering firms in India.

The Chief Producers.—A considerable portion of the armoured vehicles had been manufactured at the following workshops:—

(1) East India Railway Workshops, Tatanagar

(2) Bengal and Assam Railway Workshops, Kanchrapara

(3) Indian Standard Wagon Co., Burnpore, and

(4) Port Commissioners' Works, Calcutta

The fabrication of bullet-proof steel and the final construction of vehicles were undertaken at these workshops. Besides these major works, there were about two hunded minor contracting firms which have been employed from time to time under contractual agreements for the manufacture of components.

According to the Report on Metallurgical and Engineering Industries, from the outbreak of war till 1944 March, 4,841 armoured vehicles and 1,132 un-armoured all-steel vehicles were manufactured.

The Future Programme.—The war having ended, the demand for armoured vehicles has contracted. But the experience gained in the manufacture of armoured vehicles can be a valuable asset for the future. The technical experience gained can profitably be employed in other industrial spheres. In the post-war plans for the industrial re-orientation of the country services of experts will be badly needed. Moreover heavy steel bodies for vehicles can be manufactured in India. Similarly in regard to spare parts and equipment for maintenance, India can be an independent producer.

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Office & Works: Tanda Road, Jullundur City.
Telephone: 287.

Introduction:—The Firm of Messrs. M. Abdul Qayum Fazal Mohd. & Co. was established in 1932 with a capital of Rs. 50,000 as a private partnership concern. In the earlier stages, the Company carried on the manufacture of agricultural implements and water pumps. After some time they undertook the manufacture of many other articles such as Bath Tubs, Wash Basins, Salamanders, Buckets, Milk Cans and some sanitary equipment.

Present Position:—The Company has, till now, been manufacturing heavy and light agricultural implements. During the war, it had undertaken military contracts which included many kinds of articles such as basins, steel washing, bath tubs, sanitary equipment and bolts and nuts.

They have a competent engineer and on an average employ about 150 skilled and unskilled workers in the firm. The clerical staff consists of a dozen persons in addition.

Their workshop is well equipped and fitted with modern machines.

Future Plans:—The Company has several post-war plans. One of the most important activities in which the Company wants to be engaged, is the starting of a foundry on a large scale for the manufacture of gas, water supply and sanitary fittings. They have also in hand a scheme for the manufacture of machine tools and heavier agricultural implements.

The Acme Manufacturing Co., Ltd.

Managing Agents: Messrs. Walchand & Co., Ltd., Bombay. *Office*: Construction House, Ballard Estate, Fort, Bombay. *Works*: Slater Road Fort, Bombay 7. *Telephone*: Office:—32894, Works: 41163—61223, *Telegrams*: ACMERAY.

Introduction:—It is a joint stock company floated in 1920 by Mr. Mathuradas Vissanji. Originally they were engaged in the manufacture of motor car accessories only but later on they extended their activities to building-fittings also. Since 1930 they have been concentrating on three departments *viz.* Building Hardware, Railway Materials and Job Works.

Manufactures:—The building hardware department is run more or less in the same way as a tonnage factory where machinery operations and raw materials are, to a great extent, standardised and the department turns out a definite amount of work per day. Railway materials are, however, manufactured against definite orders and for almost all standard items produced by this department, special tools, jigs or machines are employed to maintain the quality of their products.

The type of fittings turned out by the building department of the Acme Works is extremely varied and includes butt hinges, parliamentary hinges, tee hinges, pivot hinges, self-acting hinges, spring hinges, casement stays, fan-light openers, handle knobs, casement fasteners, door holders, tower bolts, hooks, towel racks, cocks etc. These are made in brass, bronze, gun-metal or in stainless steel, in casting sheet metal, or extruded brass in different finishes such as, copper oxidised, bronze, silver oxidised, nickel-plated, chromium plated or spray painted according to the desire of the parties concerned.

The railway department can manufacture almost all items according to I. R. S. drawings and specifications and over and above this, as the factory has been well equipped, special designs to the individual tastes and requirements of each railway are undertaken. The scope of this section of the factory is extremely wide and items turned out include piston rods in stainless

steel sleeved, brass sleeved or silveroil sleeved, swan locks, ball couplings, release valves, drip trap valves, alarm valves, alarm operating lever gears, commode handles, locks, inter-vehicular coupling, roof light fittings, berth light, berth frame, parcel rack, roof tanks, vestibule frames, etc.

In the Job Work Department, special interior and exterior decoration work to the architect's or builder's own design is undertaken and can be executed in aluminium, brass, bronze, copper, stainless steel or any other metal or alloy according to the tastes and requirements of the party concerned. The following are a few of such job orders:—bank railing, hand rails, special door and window grills, lights, lamps and holders, letters and figures, cages and sliding door fittings, memorial and inscription plates, monograms, show window frames and other decorations.

Messrs. Ajax Products Ltd.

Managing Agents: Messrs. Murugappa & Sons. *Office*: Post Box No. 1356, Indo-Union Buildings, 106, Armenian Street, G. T. Madras. *Works*: Tiruvottiyur (Near Madras) *Telephone*: Office: 2921, Works: 3243, *Telegrams*: AJAPRO.

Introduction:—Messrs. Ajax Products Ltd. were incorporated in 1939 as a Public Limited Company for the manufacture of coated abrasives of various kinds and steel furniture.

ABRASIVE SECTION

Equipment:—The manufacturing section is equipped with the most up-to-date American machinery obtained at the excessive war-time costs. The Ajax Products Ltd., have also installed necessary plants for the manufacture of glue from hides, which is an important raw material in the manufacture of abrasives.

Manufactures:—At present they manufacture coated abrasives of all kinds such as flint (sand and glass) Garnet, Ajaxite in paper cloth rolls, shapes, belts, discs etc. Their productive capacity is 15,000 yds. a day of 24 hours working, although at present they are working one shift of 8 hours only.

The productive capacity of glue plant is 2 tons a month and : is almost exclusively consumed by them for coating abrasives.

STEEL SECTION

Eqipment :—The Steel Section is equipped with the latest up-to-date special-purpose machinery and is run under the supervision of experts assisted by technical men.

Manufactures :—Their present manufacture of steel equipments comprise Safes, Security Cabinets, Almirahs, Cash Boxes, Steel Cup-Boards, Racks, Locks, Hospital Furniture, Steel Tables and Chairs etc. etc., Heavy Safe Deposit Equipment with massive strong doors (proof against explosives) and safe-deposit locket cabinets are the proudest achievements of 'Ajax engineering skill and workmanship.

Future Outlook :—The products of the Company both steel furniture and abrasives have made a name throughout India. The future seems to be still brighter and they hope greater development in the lines of their manufacture under post-war reconstruction schemes.

The Aluminium Corporation of India Limited.

Managing Agents: Messrs. J. K. Limited. *Chairman*: *Board of Directors*: Sir Padampat Singhania, Kt., M.L.A. *Head Office*: Kamla Tower, Cawnpore. *Calcutta Office*: 9, Clive Street, Calcutta. *Works*: Jaykaynagar, Burdwan. *Telephone*: Head Office: 2532, Cal. Office: Cal. 4649. *Telegrams*: Head Office: 'ALUMINIUM' Cawnpore. Cal. Office: 'ALWORKS' Calcutta.

Introduction.—This is the only Indian Aluminium Concern started by the well-known Indian Business House of Singhanias in the year 1937 as a Public Limited Company. They are the first also to start extracting alumina out of Indian Bauxite by the Bayer's process.

The raw bauxite from which aluminium is produced is supplied to the factory from the Corporation's own Bauxite Mines at Ranchi about 200 miles from Asansol.

Manufactures :—The Aluminium Corporation of India manufacture alumina, electrodes, and aluminium. They also roll aluminium into sheets and circles.

The Corporation manufactures a number of aluminium compounds used in various industries.

Present Position.—The factory has got its own Causticising Plant to enable the use of soda ash and lime in place of caustic soda, if and when necessary. It has its own Paste Plant with the help of which paste is prepared from petroleum coke and pitch. This carbon paste is at present used in the manufacture of Anodes and Cathodes by the Soderberg self-baking electrolysis process. The plant is only one of its kind in this country for the manufacture of soda ash electrodes and with the help of this plant it is hoped that the Corporation would be able to produce carbon graphite and electro-thermic electrodes also. The Corporation at present manufactures 200 tons of alumina and 200 tons of aluminium each month.

The Corporation has its own colliery, railway siding and will have in the near future a full-fledged colony including its own market, residential quarters for officers and staff, supervisors and workers in the factory. It offers employment to a large number of workers numbering about 3,000. With further growth of the factory, the number of workers is expected to increase considerably.

Future Outlook.—The years of war have been years of trial for the Corporation. It is a new and key industry which must be developed in India. The Tariff Board considers that the industry qualifies for the grant of protection but the Government has deferred passing orders on its recommendations until a further technical investigation is completed. It is hoped that in due course of time the industry would be able to stabilise its position through Government assistance and protection.

Aminchand Bholanath.

Proprietor: Seth Bhola Nath, *Office & Works*: Tanda Road, Jullundur City. *Branch Office*: 24/2A, College Street, Calcutta. *Telephone*: Hd. Office: 297, Br. Office: B.B.993, *Telegrams*: Aminchand Bholanath.

Introduction:—Messrs. Aminchand Bholanath were established in 1905 and are one of the important Government Contractors, General Suppliers and Tata Dealers of the Punjab.

Manufactures:—They are the manufacturers of Buckets, Tubs, Bolts, Nuts, Rivets, Brass Cocks Bus Horns, Milk cans, Agricultural Implements etc. They have specialised in galvanizing, welding, and Mechanical Engineering.

Aminchand Payarelal.

Proprietors: Mr. Satya Paul, M.A. & Mr. Jit Paul, *Head Office & Works*: Tanda Road, Jullundur City. Phone 232, *Show Rooms*: Chowk Sudan, Julludur City. *Branches*: 1. 194, Nagdevi Street, Bombay 3, *Phone*: 28921. 2. 98, Clive Street, Calcutta, *Phone*: Cal. 239. 3. Chauri Bazar, Delhi. *Telegrams*: (For all places) APEEJAY.

Introduction:—This private firm was started in the year 1920 by the late Seth Payarelal.

Manufactures:—They manufacture Persian wheels and agricultural implements, water, steam, air and boiler fittings, chains, buckets, milk-cans, bolts, nuts and rivets.

The manufacture of water fittings was taken up in 1924. Manufacture of bolts and nuts was started in 1944 when a plant with a productive capacity of 25 tons per month was set up. All their products are upto the I. S. D. standard.

They are also engaged in sheet metal industry which constitutes quite a big part of the concern. All the processes, welding, galvanizing and tinning are maintained at a very high level of efficiency.

War-time Development:—The scarcity conditions created by the war came as a boon to the firm when their products got an easy access into the market and gained popularity. The firm executed contracts of several lakhs of rupees in its various items—sheet metal industry, water and steam fittings, bolts, nuts and rivets.

Present Position:—The concern employs about 200 workers skilled and unskilled. The sheet metal industry alone has a consumption of 150 tons of steel of various categories per month. The production of bolts and nuts is 25 tons per month, whereas water and steam fittings consume about 40 tons of brass and gunmetal per month.

Future Outlook:—The firm proposes to extend its work to a sufficiently high level. With its well equipped sales organisation at its various branches it has a very bright future.

Anand Metal & Steel Works.

Proprietors: Messrs. Anandaram Mahadeolal. *Factory*: 302A, Upper Circular Road, Calcutta. *Office*: 137, Canning Street, Calcutta. *Telephone*: Cal. 6191, *Telegrams*: SOLELY.

Introduction:—Messrs. Anand Metal & Steel Works came into being in 1945, when they acquired their present factory space from the Regent Estates, with only just a handful of workers and equipment for turning out two or three steel almirahs a month.

Later Development:—Despite the fact that they were faced with all sorts of difficulties due to restriction in steel supplies, machinery, labour, etc., they managed to keep their factory going, and it was only from the beginning of 1946, when they were fortunate enough to secure the services of Mr. K. D. Shroff, a well-known figure in the steel and hardware trade that the expansion in the output was made possible.

Manufactures:—To-day they are in a position to manufacture on a very much larger scale, well-made steel furniture, such as almirahs, adjustable racks, tables, chairs, benches, etc. with patent burglar-proof locks of special design. Facilities also exist for the manufacture of chromium fixtures of all kinds.

Present Position:—The factory employs about 50 workers, both skilled and unskilled. Some of their skilled employees possess very extensive experience in the manufacture of most up-to-date steel furniture in one of the largest factories in India.

Future Programme:—The factory has vast schemes for the future. They have already ordered for Manufacturing Plants and materials from foreign countries. As soon as they have arrived they intend to introduce various improvements in their products with a view to making them most up-to-date and modern.

Anglo Dutch Paint Colour & Varnish Works Ltd.

Proprietors: Messrs. Sanitram Nikkamal. *Office & Works*: Badami Bagh, Lahore. *Telephone*: 4970, *Telegrams*: PAINTS.

Manufactures:—They are the manufacturers of high class Paints, Colours, Varnishes and Enamels etc. and are on the approved list of Supply and other Government Departments. Besides, they have a very big engineering workshop where they manufacture parts of paints machinery and containers. Their workshop is very well-equipped with latest types of machines.

Banta Singh Shamir Singh.

Proprietor: Mr. Shamir Singh. *Office & Works*: Tanda Road, Jullundur City. *Telegrams*: BANTASINGH.

Messrs. Banta Singh Shamir Singh came into being in 1910 and since then they have been manufacturing Milk Cans, Buckets, Pails, Washing Tubs, Pans, Mortars and Agricultural Implements.

Messrs. Batliboi & Co.

Proprietors: Seth Bhogilal Leharchand Javeri. *Head Office*: Forbes Street, Fort, Bombay. *Branch Offices*: (1) Nagdevi Cross Lane, Bombay. (2) 3-153, Broadway, Madras. (3) 12/5-D, Variety Hall Road, Coimbatore. (4) Old Court House Street, Calcutta. *Telephone*: *Hd. Office*: 30007, 30008, and 30009, *Telegrams*: BATLIBOICO.

Introduction:—The firm of Messrs. Batliboi & Co., was founded in 1892 by the late Seth Jehangir Framjee Batliboi for dealing specially in oil engines and requisite gearing machinery etc. and also in small machines. It earned a good reputation for its efficiency, honesty and dependability. In 1916 the firm was sold to Seth Bhogilal Leharchand Javeri and his other partners and is now managed by Mr. V. M. Parkeh and his assistant Mr. M. S. Shah who is a specialist in the small tool

line, precision tools etc., and has helped in increasing the business of the Company.

Activities :—The Company has an electrical department dealing in electric motors, generators, transformers, switch gears etc. They are one of the foremost dealers in machine tools of all kinds—precision, standard, etc., small or big. They are capable of supplying machines with requisite power transmitters and other requirements for all sorts of pumping units, irrespective of size and type as also machines required for wood and timber trade as well as for building and furniture manufacturing purposes. Electrifications and requisite subsidiary enterprises can also be planned and worked out and requisite machinery supplied by this firm. Workshop machinery is their speciality which is the most difficult in the machinery line to deal with. Besides these lines, the Company is a supplier of machinery for pulverising, grinding of different materials as well as for flour mills, for printing, book-binding and card-board-box manufacturing.

Several other items not falling within the engineering machinery line are also handled by the Company. These include platinum pure and alloys, chains, hooks etc., enamels for gold, silver and other metals, this being a subsidiary line to gold and silversmith machinery they are dealing in. They also undertake water supply and were entrusted with the task at the time of Tripura Congress in 1939.

Although originally they handled import and supply of foreign articles only, they have now substantially increased their activities in the field of indigenous industries as well, and are at present representing various Indian manufacturers of machine tools, grinding machines, circular saw benches, grinding mills, lathes, chucks, rotary oil mills, fly presses, disintegrators, pulverisers, taps, dies etc., and they are thus contributing their quota, indirectly though it may be, to the industrial progress of the country.

The Bengal Beltings Works Ltd.

Managing Agents: Messrs. S. K. Roy & Co., Ltd., *Office*: 2, Dalhousie Square East, Calcutta. *Works*: Serampur, (Bengal). *Telephone*: Office: Calcutta. 5569, Works: Serampur 327, *Telegrams*: BEBELWOR.

Introduction:—The Bengal Belting Works Ltd., which was incorporated in 1926, should be regarded as the pioneer in the field of Belting Industry. This company was started in 1926 as a private limited company and in the same year was converted into a Public Limited Company with a capital of three lakhs of rupees.

The new factory was erected in the weaving centre of Hooghly.

Difficulties:—The Company had to face considerable difficulty in competing with foreign manufacturers particularly Japanese but it soon started the manufacture of Hose Pipes for street watering purposes which helped it to a great extent in keeping it alive.

War-time Development:—The war of 1939 came as a boon to the industry. With the progressive decline in foreign imports, the Bengal Belting Works gradually acquired the position of the principal manufacturers of beltings and hoses in this country. Five years of war proved to be a period of uninterrupted development to the Company which starting with 12 belting looms has now in possession 70 looms with other auxiliary machines.

In 1941, the Company installed its own plant for the manufacture of Cotton Yarn which is expected to meet 50% of the requirements of the factory. To finance this expansion the Company raised its capital to Rs. 6,60,000.

Present Position:—The production of the Company which was 23,09,069 inch ft. of 127 tons in 1940-41 rose to 76,99,016 inch ft. of 427 tons in 1943-44. It has now more than 500 workers in its employ. The variety of products manufactured by the Company include:

(1) Canvas Belting. (2) Composition Belting. (3) Hair Belting. (4) Conveyor Belting. (5) Rubber Belting

for Train Lighting purposes (made from cotton with rubber coating). (6) Listing. (7) Tape-neyars. (8) Web-drabs. (9) Parachute Tapes. (10) Canvas Hoses and (11) Rubberised Canvas hoses for fire-fighting.

The railways are big purchasers of their rubber and bituminous beltings for train lighting purposes. Their hoses are used by Municipalities. Government purchased huge quantities of fire hoses for military requirements and also various kinds of beltings for munition factories during the war.

Their products are also exported to Middle East, and Russia. Before the war, they had a brisk business with Burma, Indo-China, Malaya and the East Indies.

Future Programme :—There is unlimited scope for the industry if it receives protection from the State. Rationalisation has to begin with the production of raw materials in the first instance. The Bengal Belting Works have already installed their own spinning plant and are on the move for the erection of a wool-spinning plant. Cotton can be easily procured in the country and so also wool of the finest quality. Flax can also be grown locally. The Bengal Belting Works Ltd., made an experiment in flax growing at Magra in the district of Hooghly and the experiment was a great success. Flax grown there was in no way inferior to Irish Flax. If suitable machinery can be procured for the scutching of flax-fibre and spinning yarn from the same, extensive cultivation of the crop can be undertaken.

With the expected post-war industrial development of India, the demand for belting will increase and the belting industry scientifically organised and rationalised will be a valuable asset to the country.

The Bengal Electric Lamp Works Ltd.

Managing Director: Mr. H. K. Roy. *Office*: 190-C, Rash Behary Avenue, Calcutta. *Works*: 126, Mallapara Road, Jadavpur, 24-Parganas. *Telephone*: *Office*: PK—2977, *Works*: PK 182, *Telegrams*: BELAMP, Calcutta.

Started only thirteen years back in 1932, as a small undertaking more in a missionary spirit of sacrifice, by a small but determined band of workers, The Bengal Electric Lamp Works Ltd., boldly launched into the difficult field of pioneering in a highly technical industry which had at that time in India very powerful foreign rivals of international reputation with a strong hold on the Indian market firmly established for decades past.

The Bengal Company had to carry on researches untiringly and to improve the quality of its products constantly to keep abreast with the best imported foreign lamps.

That the Bengal Lamp Co., Ltd., has captured the street lighting of Calcutta and Madras and has also spread into hundreds of other Municipalities, Panchayats, Government and Public Institutions, all over India, is due to its constant anxiety to keep its standard steadily high throughout.

The Bengal Metal Works Ltd.

Managing Director: Mr. P. M. Mehta. *Office*: 117-B, Chittaranjan Avenue, South, Calcutta. *Works*: 182, Naskarpara Road, Howrah. *Telephone*: *Office*: B.B. 4645, *Works*: Howrah 406, *Telegrams*: BRASSMOULD.

The Bengal Metal Works Ltd., was incorporated in 1934. After surmounting considerable difficulties it is now an established and successful concern. They manufacture metal products, utensils for domestic and commercial purposes such as, Balti, Lotah, Tiffin Carrier, Karai, Saucers, etc.

Present Position:—The Bengal Metal Works Ltd., have a productive capacity of about 30 tons of finished products per month. On account of the war-time controls they could not

expand their production. They employ on an average about 125 workers.

Future Outlook:—The management hope for a bright future. In the post-war period the Company has definitely a position as a specialised manufacturer of brass and other metal products.

The Bengal Potteries Ltd.

Managing Agents: Messrs. S. L. Bhagat & Co. *Office & Works*: 45, Tangra Road, Calcutta. *Telephone*: Cal. 6905, *Telegrams*: PORCELAIN.

Introduction:—The Bengal Potteries Ltd. was started in the year 1919 with a capital of Rs. 10,00,000. This company grew out of a small concern called the Calcutta Pottery Works under the patronage of the Maharaja of Cossimbazar. In order to expand the activities of the concern a limited company was formed in 1919 with Rs. 10,00,000 as capital. Unfortunately on account of unstabilised conditions and inadequate technical experience, the company did not do well for some time. Consequently, it was reconstructed in 1934. The capital was reduced to Rs. 2½ lakhs. Since then the company has been making steady progress and it has now acquired fairly large assets.

Manufactures:—The Bengal Potteries Ltd., manufacture all types of ordinary household crockery, insulators, L. T. and H. T. sanitary goods, acid jars, hospital requisites, decorated pottery, laboratory porcelain, druggists' sundries and porcelain accessories for industrial purposes.

Present Position:—On account of the impetus given by the war the company has made very good progress. At present practically all their production is being taken over by the army. They employ on an average 2700 workers at present against only 300 workers in 1934.

Future Outlook:—The management are putting up further extension to their works to meet the post-war requirements for their products in the country. Their plant is one of

the most modern for this type of manufacture in Asia. During the war, the management have experienced some difficulty in procuring raw materials for better and finer quality goods. As the war clouds disappear, the management hope to import raw materials for better and finer quality goods. They are also prospecting for high-class raw materials in the country itself.

Bhartia Electric Steel Co., Ltd.

Managing Agents: Messrs. Bhartia Co., Ltd., *Office*: 42, Shibtolla Street, Calcutta. *Works*: 8, Swinhoe Street, Ballygunge, Calcutta. *Telephone*: *Office*: B.B. 5772 and 1132, *Works*: P. K. 549 and 2288, *Telegrams*: STELECTRO, Calcutta.

Introduction:—The company was formed early in 1920 under the name and style of the Pioneer Electric Steel Co., by Sir Swarupchand Hukumchand & Co.

In 1928 the company was converted into a limited liability company under the name of Messrs. Hukumchand Electric Steel Co. Ltd. In 1941, the name of the company was changed to Messrs. Bhartia Electric Steel Co., Ltd.

During the first world war, railways, engineering factories, wagon builders etc., could obtain steel castings with the greatest difficulty and after endless delays. The company, therefore, came into existence in 1920 to provide a local source of supply of all kinds of steel castings such as are in regular demand by wagon builders, railways, and engineering and other industries.

In 1942 the British India Iron & Steel Co., Ltd., was amalgamated with this company. Along with other assets of the company, two rolling mills were acquired and these rolling mills provide a useful outlet for the steel ingots produced by the parent company.

Equipment:—The steel melting equipment of the factory consists of two 40 to 50 cwts., and one 100 cwt. electric steel melting furnaces manufactured by Stobie Metallurgical Construction Co. The furnaces are of the tilting type and are served by

over-head cranes. Besides the heavy melting scrap, steel turnings and borings are used in the charge in an appreciable measure.

Items of Manufacture:—The variety of steel castings which the company is producing are:—

(*a*) Railways:—Locomotive Parts such as Axle Boxes, Motion Plates, Wheel Centres, Bogie Frame Stays, Bogie Centre Pivots, Buffers, Drag Boxes, Horn Cheecks, Rubbing Blocks, etc., etc.

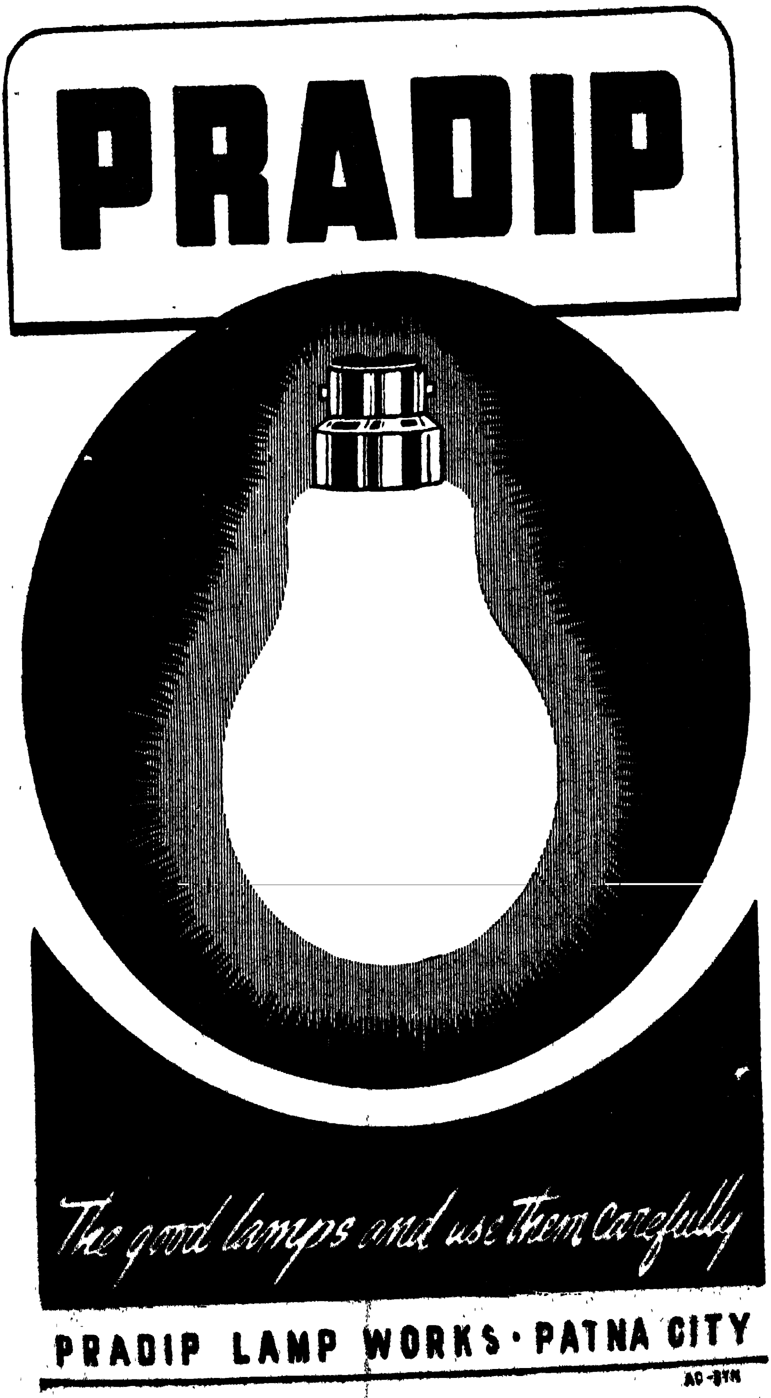
(*b*) Carriage and Wagon Parts such as Axle Boxes, Buffers, Head Stock Stricking Castings, Draft Yokes, Bogie Pivots.

(*c*) Wagon Builders:—Similar to (*b*) above.

(*d*) General Engineering Works:—Bridge Bearings, Spur Wheels, Gear Wheels, Pinions, Hydraulic Cylinders, Spare Parts for Sugar and Oil Mills, Cast Steel Pipes, Bends, Elbows, Tees, Man-hole Covers, etc., etc., for Boilers.

Production:—The present production of liquid steel is nearly 1,000 tons per month of which 30% is employed in steel castings and the rest is cast in the shape of ingots. Steel can be produced to any required specification and at present the company is concentrating on the production of special steels. The capacity of the rolling mill is well over 850 tons per month.

Labour:—Messrs. Bhartia Electric Steel Co., Ltd., at present employ on an average 1,800 workers per day.

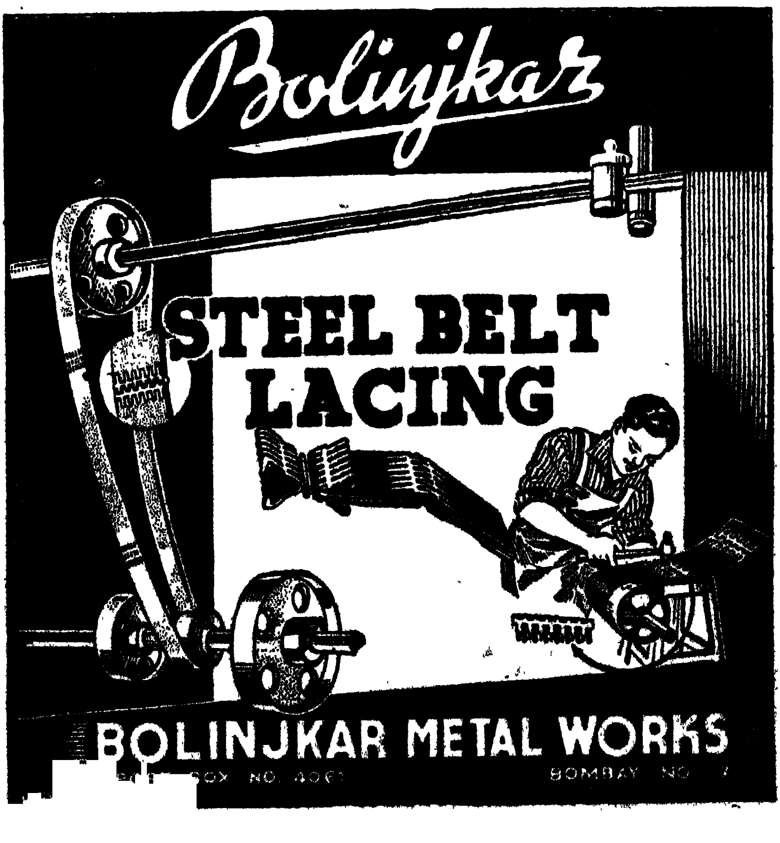

PRADIP
The good lamps and use them carefully
PRADIP LAMP WORKS · PATNA CITY

Bharat Sheet Metal Industries.

Managing Directors: (1) Mr. S. B. Dutt, B.Sc., A.M.Ch.E. (N. C. E.) P. 338, Mudiali Road, Calcutta. (2) Mr. B. C. Ghose, B.Sc. (Econ) (London) B. Com. (London) 63/1, Mahanirvan Road, Calcutta. *Office*: 78, Clive Street, Calcutta. *Works*: P. O. Ghugudanga. 22, Beerpara Lane, Dum Dum, (24 Parganas). *Telephone*: B.B. 4959.

Manufactures:—This joint stock Company was incorporated in the year 1939 and is engaged in the manufacture of washers, stoves, cooking containers, staples, punching machines, rat-traps, steel furniture and other hollow-ware products.

They propose to take up the manufacture of Hurricane Lanterns also.



The Bharat Tool Manufacturing Co., Ltd.

Managing Director: Mr. Sankalchand G. Shah, B.A., LL.B., C/o. New India Rayon Mills. *Office & Works*: Mathuradas Mills Compound, Lower Parel, Bombay 13. *Telephone*: 61466, *Telegrams*: BHARATTOOL.

Manufacture:—They manufacture small tools such as Taps, Dies, Reamers, Jigs, Fixtures, Milling Cutters (except involute), Sliting Saws, End Mills, Planning Knives, etc. Mention may be made of the following particulars of their manufacture:—

1. Taps Whit. St. T. from ¼″ to 1″ rising by 1/16″.
2. Taps B. S. F. T.
3. Circular Dics W. S. T.
4. Circular Cutting Dies B. S. F. T.
5. Hand Reamers Straight and Taper Shanks.
6. End Mills Cutters Morse Taper & Straight Shanks.
7. Milling Cutters H. S. S. (except involute).
8. Circular Saws.
9. Woodruf Keyslott Cutters.
10. Machine Chucking Reamers.
11. Form Tools.
12. H. S. S. Cutting bits for tools-holders.
13. All kinds of planing knives, Moulding Cutters and Blanks, Tonguing and grooving Irons, Wood-wool knives, etc.
14. 60 deg. Counter-sink Drills.
15. Little Giant type Dies W. S. T. & B. S. F. T.

The Binani Metal Works Ltd.

Managing Director: Mr. G. D. Binani. *Head Office*: 38, Strand Road, Calcutta. *Factory*: Foreshore Road, Shibpur, Howrah. *Telephone Head Office*: BZ. 5383, *Factory*: Howrah 1934, *Telegrams*: NONFERROUS.

Introduction:—The Non-ferrous Metal Industry in India has had a phenomenal growth during the recent war and the Binani Metal Works Ltd. also played its part in the successful stabilisation of the industry. The Company is fortunate in having Mr. Govardhandas Binani as its Managing Director who has long experience in this line gained through the heritage of generations and whose name is closely associated with the Non-ferrous Metals trade and industry in this country.

During the war the development of the Company has been very remarkable and to-day it has to its credit a well equipped factory managed by expert technical staff with foreign experience. The Company has its own laboratory and the manufacture of the alloys is scientifically controlled. The products are of the highest standard.

Manufactures:—The products include all sorts of Non-ferrous Metal alloys such as—Antifriction White metals, Tin Solders, Type-metals, Gun metals, Phosphor Bronze, Bellmetal, Brass, Aluminium alloys, Lead Bronze, Manganese Bronze, Nickel Silver etc. Orders to any specification are executed.

Further expansion of the Company is now engaging the attention of the management.

Messrs. B. M. Singh & Son.

Proprietor: Mr. B. M. Singh. *Office & Works*: 1, Crooked Lane, Calcutta. *Telephone*: Cal. 1531, *Telegrams*: REFINEMENT, Calcutta.

They work as mechanical and electrical engineers and do job work according to the requirements of the parties concerned.

Bolinjkar Metal Works.

Managing Partner: Mr. M. K. Chaphekar. *Office & Works*: Nana Chawk, Grant Road, Bombay 7. *Telephone*: 40168, *Telegram*: ALLIGATOR.

Introduction:—Messrs. Bolinjkar Metal Works are the pioneer manufacturers of Steel Belt Lacings in the country. It is a partnership concern which was started in 1942 with a capital of Rs. 12,000 with Mr. B. J. Bolinjkar and Mr. M. K. Chaphekar as the partners. Subsequently the capital was raised by another Rs. 76,000 so that the present capital investment in the works is about one lakh of rupees. Located at the port town of Bombay it has the advantage of an industrialised centre both for the availability of the raw materials required and a ready market for its finished products.

Equipment and Manufacture:—As the works came into being during the abnormal times of the war necessary equipment for it had to be obtained from manufacturers in the country. At present the manufacture of lacings is carried on with separate dies for different processes of cutting, embossing and pressing but this is soon going to be replaced by one single die for all the three processes.

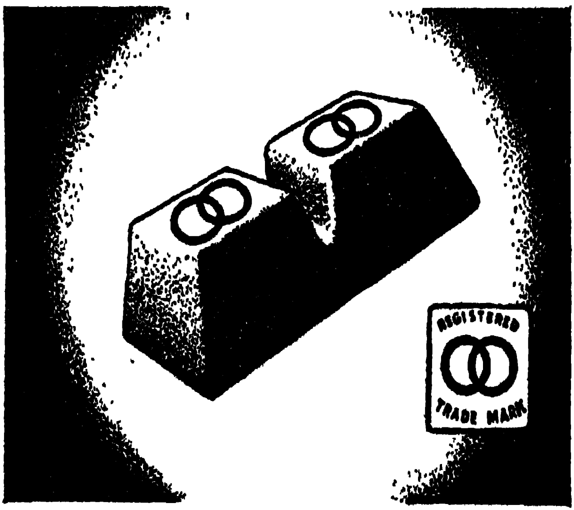
Their present production of steel belt lacings has been on an average 20,000 boxes in a year although their capacity is several lakhs. In addition to the steel belt lacings Messrs. Bolinjkar Metal Works manufacture rice huller Screens, iron hinges, pant buckles and clips, mill parts and cycle accessories also.

Difficulties:—During the war the supply of raw materials was never adequate and regular firstly because of insufficient quantity produced and secondly due to more urgent operational demands of the army for transport purposes. Besides Industry being new to the country there was a dearth of skilled labourers who had to be trained in the works itself.

Future Outlook:—The works are apprehensive of foreign competition who monopolised the market before the war and who might again make a bid to re-capture it when normal peace

conditions return. The industry is before the Tariff Board for protection.

Considering the importance of the Steel belt lacings Industry to the national economy of the country Messrs. Bolinjkar Metal Works feel proud of the little contribution they have made towards the establishment of an industry formerly unknown to the country.


REGISTERED
TRADE MARK

Bombay Brass Works Co.

Proprietors: Mr. G. Y. Bhatti & Mr. M. L. Bhatti. *Office & Works*: Nakodar Road, Jullundur City. *Head-Office*: Chowk Sudan, Jullundur City. *Telegrams*: EAGLE.

Introduction:—The Bombay Brass Works Co. was established in 1938 as a partnership concern. It has a modern and spacious building for its factory situated at a convenient distance from the city and is equipped with modern and up-to-date machines.

Manufacture:—The manufactures of the Company include G. M. Brass Water and other sanitary fittings such as Brass Bib, Plug, Wheel Cocks, Showers and Brass Presses etc. under their well known trade mark, "EAGLE".

Labour:—It has in its employ about 200 men highly skilled in their trade.

Difficulties:—At present the supply position of non-ferrous metals is not satisfactory and is greatly affecting the Company's output. In order to overcome this difficulty and have a regular flow of metals the Company has started importing metals, direct from foreign countries.

The Bombay Steam Navigation Co., Ltd.

Managing Agents: The Scindia Steam Navigation Co., Ltd., *Office*: Scindia House, Ballard Estate, Bombay. *Works*: Mazagaon, Bombay. *Telephone*: 46084, *Telegrams*: SHEPHERD.

Introduction:—The Bombay Steam Navigation Co. Ltd., was incorporated in the year 1906 when she took over the fleet and other properties of a private company known by the same name. The Company also purchased a small slipway at Mazagon known as 'Viegas Patent Slip'. Excepting a slipway there was no other machinery there at that date. The Workshop was gradually built up by addition of plants and machinery according to the requirements of the Company. There is

no separate capital investment for the workshop. It is at present fully equipped to carry out repairs to ships and is also equipped to build small launches up to 100 feet in length.

Activity:—The main activity of the Workshop, however, is ship-repairing.

The Britannia Engineering Works & Foundry.

Managing Agents: Messrs. Tulsiram Badriprasad. *Office & Works*: 34/35, Haraganj Road, Salkia, Howrah. *Telephone*: Howrah 585, *Telegrams*: METALMART.

Introduction:—The Britannia Engineering Works & Foundry is of 30 years standing with 3 principal sections comprising Foundry, Engineering and Galvanising Workshops.

Manufactures:—All sorts of Railway, Jute Mills, Rice Mills and Government Castings—Anchors, Soleplates, Transportation Attachment Brackets, Saddles and various kinds of P. & T. Department Castings, are undertaken.

Stay Rods, U-Backs, Stalks, Shackles, Channel Iron, Angle Iron, Shovels, Anvils, Wrench, Sanitary fittings, essential domestic utensils and various kinds of M. S. items.

Metals, Brass Strips, Copper strips, Mc. Intyre Sleeves and such other kinds of Electrical goods used by P & T Department.

Galvanising—All sorts of galvanising work is undertaken specially of castings made of cast iron and of iron materials which are made of mild steels.

The Bungo Steel Furniture Ltd.

Managing Director: Mr. R. Ghosh. *Office & Works*: 57, Diamond Harbour Road, Kidderpore, Calcutta. *Telephone*: South 302, *Telegrams*: OGNUB.

Messrs. Bungo Steel Furniture Ltd., manufacture steel furniture of all kinds like almirahs, cupboards, steel shelving and cabinets, storage racks and safes etc.

The Calcutta Electrical Mfg. Co., Ltd.

Managing Agents: Messrs. Jute & Gunny Brokers, Ltd., *Office*: 8, Royal Exchange Place, Calcutta. *Works*: 6, Ghore Bibi Lane, Narkeldanga, Calcutta. *Telephone*: *Office*: Calcutta—4425, 4770, 1888, *Works*: B. B.—4794, *Telegrams*: *Head Office*: GUNSHIP, Calcutta, *Works*: RIENTO, Calcutta.

Introduction:—The Calcutta Electrical Mfg. Co., Ltd., was incorporated in 1936 with Messrs. Daya Ram & Sons, as Managing Agents. It commenced work in 1937, but due to unfavourable circumstances, it was not possible to achieve the results expected. In 1941, Messrs. Jute & Gunny Brokers, Ltd., undertook the management of the Company. Since then the progress has been remarkable.

Present Position:—The Factory is at present producing daily a large number of fans and regulators and other electrical goods. Its fans are sold under the trade mark of "Orient". In the year 1942, the Government of India required this firm to manufacture not only fans and regulators for them, but also shells up to the bottling stage and this work has been executed with a high degree of efficiency.

Since the present Managing Agents took over the charge many new and up-to-date machines have been installed. The production has already gone up four times of what it was in 1941. To enable the Company to produce high quality goods it has engaged many foreign technicians and a large number of skilled workers.

Future Programme:—For the development and expansion of its electrical goods business, the Company has a large project under consideration. A very big plot of land has already been acquired with this end in view. A large well equipped factory designed to be the most up to-date of its kind in India, is planned to be erected there, and machines capable of producing various types of electrical goods will be installed. The Company has also made arrangements for importing the necessary machinery from abroad for this purpose. With this expansion, the productive capacity of the concern will increase considerably, and the Company would be in a position to manufacture all sorts of electrical goods—fans, motors, motor pumps, transformers, switchgears, alternators, etc.

The Calcutta Expanded Metal Mfg. Co., Ltd.

Managing Agents: Messrs. Rungta Sons Ltd., *Office*: P-16, Kalakar Street, Calcutta. *Works*: 1, Kundan Lane, Lillooah, Howrah. *Telephone*: Office B.B. 6627 & 3655, Works: Howrah 742, *Telegrams*: SWAGAT.

Introduction:—The Calcutta Expanded Metal Mfg. Co. (now Limited) are the pioneers in the Expanded Metal Industry as they were the first to take up the manufacture of expanded metal. The factory started work in 1938 and has ever since been manufacturing expanded metal to B. S. Specifications. There were some initial difficulties with regard to the procurement of suitable quality of raw materials, steel for blades and skilled workers for this type of work but the efficient and able management of the firm enabled it to tide them over.

The outbreak of the war soon after their establishment came as a boon to them. Foreign sources of supply were cut off and there was a great demand for expanded metal from the Government for Defence requirements. The firm came to the assistance of the Government and put its entire production at their disposal who were so well satisfied with their products that they granted a certificate to the firm in appreciation of the services rendered by them. During this period they got every assistance from the Government in the procurement of raw materials and other things.

With the termination of the hostilities, the demands from the Government have stopped, and with it stopped the assistance from the Government. This is causing them serious difficulties, for to meet the huge demands of the post-war industrial developments they still stand in need of their help till such time as normal sources of supply of raw materials are not easily available.

Future Outlook:—In the beginning the Company experienced some difficulty in competing with foreign manufacturers, but as stated above, the war removed them from the field for some time and they have been able to gain popularity. They are confident that together with the other factories engaged in the production of expanded metal they should be able to meet the entire demand of the country huge though it may be because of the various uses for which expanded metal is required.

The firm is, however, apprehensive of foreign competition unless the Government come forward to protect the industry. The matter has, however, been taken up by the Engineering Association of India (Expanded Metal Panel) and it is expected that the case of the industry will receive due consideration at the hands of the Government.

Castings Corporation (India) Ltd.

Managing Director: Mr. S. K. Das. *Office & Works*: 45, Madhusudhan Pal Chowdhury Lane, Bantra, Howrah. *Telephone*: Howrah 333, *Telegram*: RIVETBOLTS.

Introduction:—At the very outbreak of the Second World War, the present management of the Company felt the necessity of starting a Metal Casting Foundry, on a large scale on scientific lines, in the Industrial area of Howrah. The construction of the factory sheds and the furnace and the erection of the plant were completed in 1943.

Activities:—The Company specialises in soft grey iron Castings of Machinery, Cock & Valves, Electric Fan bodies and other electrical fittings, Ry. Signal fittings, Lamp posts etc. The weights of the Castings range from a few ounces to

tons. The daily out-put is about 5 tons for the present but a bigger cupola has been set up to increase the production.

The quality of Castings turned out gave the Company an easy access to the Defence and Civil Departments of the Government who placed heavy indents in the very first year of the Company's life.

In 1944 the Deputy Director General of Munitions Production, Calcutta, entrusted the Company with orders for a huge quantity of Sockets for Telegraph Posts. The Company also executed heavy orders from the Indian Post & Telegraph Department and many other public utility concerns. All these speak of the efficiency of the Company in its very infancy.

Management:—Within these few years of its existence the Company has been lucky enough in establishing a good reputation in the local market as well as in Government Departments. This, as well as the steady progress of the Company is entirely due to the untiring efforts and enthusiasm of its managing Director Mr. S. K. Das, under the guidance of the other Director Mr. D. K. Das of Messrs. D. K. Das & Co., Ltd.

Future Outlook:—With the cessation of hostilities the Company has taken up new schemes and for these, new lands and factory sheds are being added. The management contemplates the manufacturing of several patent products for the civil market. Moreover some expensive arrangements are being made for castings of non-ferrous metals.

Messrs. Chuttan Mattumal,

Prop. of Messrs. Shiva Iron & Brass Works.

Proprietor: Mr. B. D. Gupta. *Office & Works*: Chawri Bazar, Delhi, *Telephone*: 5062, *Telegrams*: MACHINERY.

Introduction:—The factory was established in 1920 under the name and style of the Shiva Iron & Brass Works. The original plan included the manufacture of small articles in casting of ferrous and non-ferrous metals with a limited number of machines and a small cupola of one ton capacity.

Later on, it was considered that Kolhus and other heavy machinery parts could also be manufactured. With this end in view, the cupola was enlarged to eight ton capacity and heavy duty lathes, drilling and planing machines were installed.

Present Position:—At present they are manufacturing sugarcane crushers, shafts, W. I. split pulleys, brass plumber cocks, shaft couplings, collers, sluice valves, various types of hand presses, press plates and frames of sugar mill, and road rollers, etc. In addition to these items of manufacture they undertake huge castings in ferrous and non-ferrous metals against specified orders. They also undertake all sorts of planing, turning and milling work.

Future Plans:—Their present productive capacity is not sufficient to meet the market demand. It is, therefore, considered essential to extend the workshop and the foundry. For this purpose, the management are intending to import up-to-date equipment like capstan, turret lathes, milling machines, drilling machines, slotting machines etc.

Messrs. Cooper Engineering Limited.

Managing Director: Sir D. B. Cooper. *Head Office*: "Construction House" Ballard Estate, Fort, Bombay. *Works*: Satara Road, (M. S. M. Rly.). *Telephone*: 26038 *Telegrams*: "COOPENG" Bombay, "COOPER" Satara Road.

Introduction:—Messrs. Cooper Engineering Limited came into existence in the year 1922. Their original programme consisted of manufacture of Agricultural Implements and Machinery. The firm has been progressing from the date of its establishment as will be seen from their range of production described below.

ITEMS OF MANUFACTURE

Diesel Oil Engines:—In 1932 Internal Combustion Engine manufacture was introduced with a range of solid injection type Diesel Oil Engines in sizes from 7 B. H. P. to 30 B. H. P. These engines were of the modern cold starting

four cycle design and were very soon in great demand for irrigation work, electric light generation and other industrial purposes.

Their range of Industrial Diesel Oil Engines to-day includes single cylinder, horizontal, cold-starting solid injection four cycle types from 7 B. H. P. onwards, twin cylinder types from 100 to 128 B. H. P. and four cylinder types from 200 to 256 B. H. P. together with a recently introduced design of 10 B. H. P. High speed Engine operating at 1,000 R. P. M. approximately 500 B. H. P. in Diesel Oil Engines is manufactured each month at the present time.

Machine Tools :—The enterprise of the Cooper Engineering Limited led to the commencement of Machine Tool manufacture in this country in the year, 1937. In the beginning they introduced the manufacture of lathes and shaping machines, which found a ready market. The result was that the Department manufacturing machine tools had to be developed and extended steadily. The advent of the war in 1939 gave a great fillip to the engineering concerns throughout the world to manufacture machine tools. And consequently Messrs. Cooper Engineering were called upon to utilise their energies and resources to increase their production of various products. The Government of India found it advisable to consider the manufacture of high class machine tools in India which were so far considered impossible to manufacture in this country. The experience that the Cooper Engineering had in machine tool manufacture placed them in a very favourable position to undertake readily the manufacture of highest class machine tools. Their manufacture in this line consists of Capstan Lathes, Sliding, Surfacing and Screw Cutting Lathes, Ball Bearing Type, Drilling Machines, etc. Their design conformed to one of the most reputed tool manufacturers in the United Kingdom. Under the exigencies of the war, designs of earlier types of shaping machines etc. had to be modified to meet the requirements and they produced machine tools of the highest standard. Their works were organised for improved production method; a new Machine Tool Expansion Scheme Department was established for the manufacture of the Machine Tools exclusively.

Textile Machinery:—In the year 1930, Messrs. Cooper Engineering took to the manufacture of textile looms and have since been supplying the demand of the Textile Industry for thousands of looms in sizes from 36″ to 120″ width. The role of Cooper Engineering Limited in the manufacture of looms for Cottage Industry has been remarkable. Thus they are one of the few concerns in India, which manufacture Textile Machinery on a large scale.

Agricultural Implements:—As already pointed out, the original plan of Messrs. Cooper Engineering was the manufacture of agricultural implements and machinery. For a country like India where agriculture is primary and other industries are secondary, the manufacture of agricultural machinery was considered very desirable. In the year 1940, due to constant increase in demand for their agricultural implements, it was necessary for them to carry out huge extension in their works. A new Foundry was erected and a new Pattern Shop and a new Diesel Oil Engine Assembly Department were established and the Main Machine Shops were extended.

Meehanite Metal:—As pointed out above during the war period considerable extension in various departments of the Works have been made. In 1939, they entered into an agreement with the Mechanite Metal Corporation of America whereby they became the sole Licensees and manufacturers of Meehanite Metal for India, Burma and Ceylon. In order to give an idea about Meehanite, we give below the following lines:—

Description of Meehanite Metal:—Meehanite High Duty Iron Castings have a tensile strength up to 25 tons per square inch as cast, and are capable of being heat-treated to give 35 tons tensile strength. Meehanite Metal is the name given to a number of different grades of high Duty Irons which are in all of 21 Standard Grades each having a different combination of physical properties required for particular needs. Castings are supplied for general engineering purposes, heat resisting, wear resisting and corrosion resisting. Their manufacture is based on strict control of the actual physical properties of the metal and the actual metallurgical structure of Meehanite castings is pre-determined in the molten metal. The structure is so controlled and regulated as to produce the physical properties

required of the castings for particular service conditions. The entire process is highly scientific and is carried out under close metallurgical supervision.

Messrs. Cooper Engineering Limited have built a complete Mechanical Testing and Chemical Laboratory which is fitted up with the equipment of the latest design whereby they are able to keep close control on the various grades of metal produced.

Meehanite Metal has replaced many steel castings and high class steel. The supplies of Meehanite have been made for Air Craft, Gun, and Tool manufacture, for the manufacture of railways and machine tools. In many cases, the life obtained from the use of Meehanite castings has exceeded even that of carbon steel, which lasts for a fairly long period.

Quite recently they have granted licences for the manufacture of Meehanite to the following firms in India:—

(1) The Indian Hume Pipe Co., Ltd., (Wadala).

(2) Messrs. Binny and Co., (Madras).

(3) Messrs. Jessop and Co., Ltd., (Calcutta).

(4) Messrs. Jay Engineering Works, Ltd., (Calcutta).

They, however, intend to grant licences to other factories as well working in different parts of India.

Diesel Engine Road Rollers:—Messrs. Cooper Engineering Limited also manufacture Diesel Engine Road Rollers. The model on which manufacture is at present being concentrated is a 6/8 ton machine being diesel driven and designed with a 3 speed and reverse gear box. The power unit is a Horizontal, Single Cylinder, four cycle, Gold Starting Cooper Diesel Oil Engine, designed specially for road roller propulsion. It is of extremely simple design, very robust in construction and developes the correct power in ratio to the weight and duty of the road roller. The complete road roller incorporates all special features similar to those on imported machines. Meehanite Metal High duty castings are used throughout in place of ordinary grey iron castings and high quality steels are incorporated where considered essential. Extra fittings such as water sprayers, pump and hose connections, winding gear, power pulleys, sacrifiers etc. can be

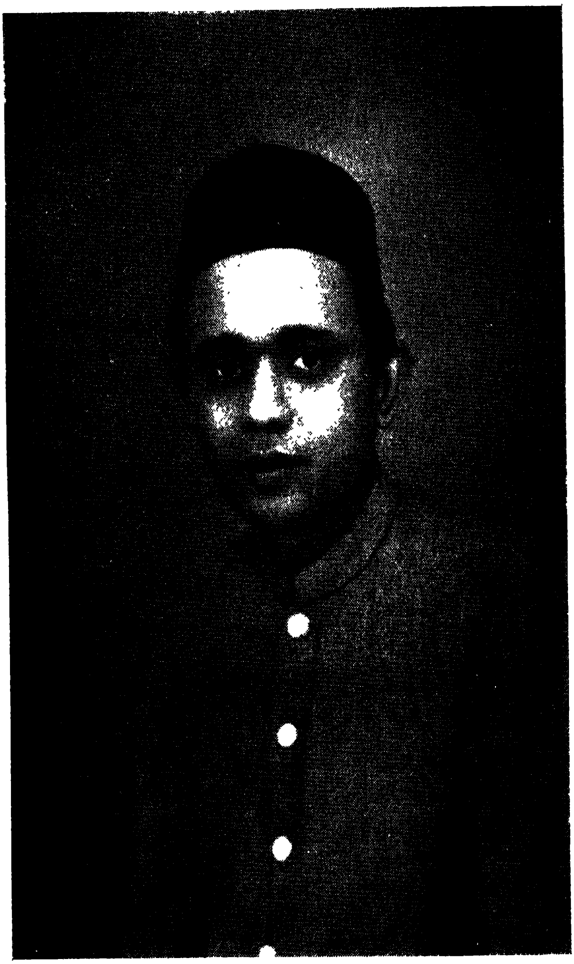
supplied if desired. Designs are also proceeding for a 10/12 ton size machine.

Air Conditioners :—A few sample Air Conditioners have already been produced, these being of the 3/4 ton size. The sets produced are self contained and they are proceeding to manufacture 40 of these units which they hope to be able to offer to general public or commercial firms. Certain difficulties have, however, been to overcome in the manufacture of the sets already produced simply due to difficulties in obtaining imports of certain special parts which it is impossible to manufacture in this country at the present time.

Present Position :—To-day Messrs. Cooper Engineering possess some of the finest types of machines which are used for the manufacture of Internal combustion engines, Machine tools, Textile Machinery, Agricultural implements, etc. Most modern methods of production are employed in their works which are fully equipped with all the facilities to enable them to manufacture among other things, the latest range of Diesel Engines without having the necessity of importing parts with the exception of fuel oil injectors and fuel pumps for certain sizes of engines. All the engines manufactured by them are subjected to an exhaustive test before leaving their works and they have supplied engines of thousands of Horse Power in aggregate for India's war requirements and civil use. They employ about 1500 workers of which 50 per cent. are skilled and semi-skilled and the rest unskilled. Their treatment of their workers is noteworthy.

After trials and tribulations which a new enterprise is bound to face, Messrs. Cooper Engineering Ltd., stand out as one of the most efficient engineering concerns in this country.

Their post-war development plans include increase in the number and types of machine tools and additional types of internal combustion engines, etc.



Seth V J. Shanghvi.
Mg. Director
Dhiraj Pen Mfg. Co., Ltd.
Bombay

Delhi Iron Syndicate.

Proprietor: Mr. Hansraj G. Gupta. *Office & Works*: Ajmere Gate, Delhi. *Telephone*: 5065, *Telegrams*: SINDICIRON.

The firm was started in 1921. In addition to being a very big dealer in iron and steel materials, the firm has also a foundry for iron castings.

Dhiraj Pen Mfg. Co., Ltd.

Managing Director: Mr. Vallabhdas J. Shanghvi, *Office*: 75, Shamset Street, Bombay 2. *Works*: (1) Kasturchand Mill Compound, Dadar, (B. B. & C. I.) Bombay 14, (2) Andheri. *Telegrams*: 'CITYPEN' Bombay.

Introduction:—The company was established by Mr. V. J. Shanghvi in 1942 with the object of manufacturing fountain pens and spare parts. The war was in full swing and the required machinery could not be imported from abroad. Technicians and raw materials were also diffcult to obtain. The factory was, therefore, equipped with indigenous machines and the work was started with such workmen and materials as were available indigenously.

Manufacture:—Three varieties of pens *viz.* Baby size, Big size and Self Filler were introduced into the market under 'Metro' brand and in different colours. Their products received very good response and they were encouraged to employ more men and machines in their works to increase their production.

At present they are manufacturing over 2,000 doz pens and spare parts per month although this gives no indication of their productive capacity which is not being fully employed on account of scarcity of raw materials.

The Company has appointed Messrs. Kiron & Company of 73-75, Chhipi Chawl, Bombay 2, as their sole distributors for India. Their articles are already selling in the Ceylon market and orders and enquiries received from Africa, Burma,

Iran and Iraq may soon result in the export of their articles to these countries also.

Present Position: The Company has now two factories one at Dadar and the other at Andheri. In one of these factories they have plants for the manufacture of all varieties of Fountain Pen clips and Nibs.

Future Plans:—They have a scheme to instal an additional plant for the manufacture of Jewelleries like Rolled Gold buttons and chains etc. The firm has further opened negotiations with some U. K. and the U. S. A. firms for the supply of latest types of machines for the manufacture of low and high grade Fountain Pens.

Labour:—At present there are 400 to 600 workers in both the factories.

Future Outlook:—Their aim is to continue to improve the standard of their articles so as to bring it on a par with high grade fountain pens. The firm is also taking up the manufacture of raw materials like Celluloid, Xylonite, Plastics and Ebonite etc. as allied products. The proprietor Mr. V. J. Shanghvi is already on a visit to the U. K. and the U. S. A. for the purchase of necessary machines and materials etc. and also to obtain technical advice for the purpose.

Messrs. D. K. Das & Co., Ltd.

Proprietors of: Bantra Engineering Works. *Managing Director*: Mr. D. K. Das, M.A. *Office & Works*: 233, Belilios Road, Howrah. *City Office*: 84-A, Clive Street, Calcutta. *Telephone*: Howrah 970 & 971, *Telegrams*: 'MONIMA' Howrah.

Introduction:—D. K. Das & Co. was started in 1917 by the Late Aviator Mr. Binoy Kumar Das. He took his training in the big workshop of Messrs. Apcar & Co., Shibpore, Howrah who owned several cargo and passenger ships plying between Calcutta & Japan. The sense of duty and perseverence of late Mr. Das drew the attention of his superiors and he, when a lad



Late Aviator Mr. B. K Das
Founder
Messrs D. K. Dass & Co., Ltd.
(Bantra Engineering Works)
Howrah

of only 18, was engaged as the 4th Engineer of one of the Company's Japan-going vessels.

In the year 1917 when the great war was drawing to a close and there was a scarcity of imported articles, the late Mr. Das with his brother Mr. D. K. Das started the Bantra Engineering Works and began manufacturing Steam & Water Cocks and Valves, Power Transmission Fittings etc. These were in demand in increasing number on account of their nice finish.

In 1922, the late Mr. B. K. Das went to England to visit factories and to see their working.

Later Developments :—Messrs. D. K. DAS & CO., the firm of proprietors, in the meantime, were enlisted as a supplier to B. N. Railway, for Telegraph Pole fittings and a few other articles. On account of the quality and finish of their products, they were entrusted with more important jobs such as Carriage and Wagon Body and Lavatory fittings, Permanent Way materials etc. In 1927 B. N. Railway passed on to them contracts of greater responsibility such as Loco Duplicate parts—Axle Bearings, Connecting Rod Bushes, Slide Valves, Eccentric Straps, Boiler Mountings etc. D. K. DAS & CO. were the first Indian concern to be entrusted with such contracts.

The reputation thus gained gave the firm an easy access to other railways like the E. I. Railway, E. B. Rly. (B. A. Rly.), N. W. Rly., Burma Railways and the Indian Stores Department. They turned out more important works such as Signalling and Interlocking materials. Since then they have been recognised by these railways and by the I. S. D. as one of their first class Contractors. They are now on the approved list of Suppliers to the Corporation of Calcutta also.

Other Manufactures :—Besides supplying Railway Materials, Bantra Engineering works help the growth of small Industries by making and supplying Industrial Machinery. They manufacture for the present, Hand Press for Sheet Metal Work, Baby Power Press, Tablet Making, Bucket Making, Soap Stamping Machines and Hand Pumps etc.

They are also engaged in the manufacture of machines and parts for Sugar, Jute & Cotton Mills.

With the growth of activities, the firm of Messrs. D. K. Das & Co. was converted into a Limited Liability Company in 1938 with Mr. D. K. Das as managing director and Mr. P. K. Das as director.

In 1938 Mr. D. K. Das went out to U. K. to purchase some up-to-date machinery for the workshop. He also secured Sole Agencies of some High Class Engineer's tools and stores.

During the last world war the workshop was busy making various war materials of which special mention may be made of Armoured Vehicle parts, Lorry Filter Equipments, Hooks and Shackles for lifting tackles, Injector & Ejector Cones for Locomotive and so on.

After the war the Company have reverted to their peace-time jobs:—

1. *Valves and Cocks for Steam, Water and Gas.*

    (*a*) Sluice Valves.

    (*b*) Stop Valves.

    (*c*) G. M. & C. I. Plug Cocks, Gland Cocks etc.

    (*d*) Relief Valves.

    (*e*) Reducing Valves.

    (*f*) Release Valves.

    (*g*) Safety Valves.

2. *Power Transmission Appliances.*

    (*a*) Pulleys C. I. & W. I.

    (*b*) Plummer Blocks with brasses.

    (*c*) Shaft Couplings.

    (*d*) Bright Shaftings.

    (*e*) Wall Boxes & Brackets etc.

3. *Railway Loco, Carriage and Wagon Duplicate Parts.*

(*a*) Axle Bearings.

(*b*) Connecting Rod Bushes.

(*c*) Injector Cones.

(*d*) Slide Valves.

(*e*) Boiler Mountings.

(*f*) Carriage Lavatory Cocks.

(*g*) Carriage Body Fittings-Door Hinges, Handles, Locks, Berth & Seat Frames, Ventilators etc.

(*h*) Wagon Fittings—Brake Racks, Axle Guards, Pin & Chain, Door Cotters, Hinges, Lashing Chains, Hooks, Shackles etc.

4. *Railway Signalling and Interlocking Materials.*

(*a*) Locks, Locking Boxes, Keys, etc.

(*b*) Semaphore Spectacles, Bearings etc.

(*c*) Wire Pulley, Brackets, Thimbles etc.

(*d*) Cranks, Stretcher Bars, Counter-weight lever etc.

(*e*) Detector Units.

(*f*) Mechanism Switch & Lock Movements etc.

5. *Railway Permanent Way Materials.*

(*a*) Heel Blocks, Check Blocks, Distance Blocks.

(*b*) Split Cotters.

(*c*) Bolts, Nuts, Rivets.

(*d*) Spanners etc.

6. *Telegraph Pole Fittings.*

(*a*) C. I. Sockets.

(*b*) Brackets for Insulators.

(*c*) Wire Adjusting Screws.

(*d*) Guy Clamps etc.

Mill Machine Parts.

(1) SugarMill—Crusher Bearing, Crusher Couplings Filter Press Plates Frames and Cocks, C. I. Pipes & Specials, M. S. Cane & Intermediate Carrier Slats; Carrier Chains, Sulphur Burners, Sulphur Valves, Gate Valves, Pump Bodies (both C. I. & G. M.) etc. etc.

(2) Jute Mill—Pinions of all descriptions, Pressing Rollers, Returning Rollers, Picking Shafts etc., etc.

8. *Small Industrial Machinery.*

(*a*) Screw Press.

(*b*) Tablet Making Machine.

(*c*) Bucket Making Machine.

(*d*) Soap Stamping Machine.

(*e*) Jeweller's Polishing Lathes etc.

9. *Sheet Metal Articles.*

(*a*) Latrine Pans.

(*b*) Guttering & Riggings.

(*c*) Water Drums.

(*d*) Corrugated Iron Dust Bins.

(*e*) Fire Buckets.

(*f*) Ventilators.

(*g*) Baking Tins.

(*h*) Railway Signal Lamp, Gate Lamp, Hand Signal Lamp etc.

Messrs. D. N. Singha & Co.

Proprietor: D. N. Singha. *Office & Works*: 61, Sitanath Bose Lane, Salkia, Howrah. *Telephone*: Howrah 348.

Introduction:—Messrs. D. N. Singha & Co., was started in the year 1905 with only one small cupola for castings. Gradually they started a machine shop and began to supply mechanical goods e.g., C. I. Pans used by agriculturists, plumbing and sanitary fittings.

Manufactures:—They are manufacturers of the following:—

Water supply fittings:—Cast Iron Rain water and Soil pipes and fittings, Air cocks, Ball valves, Bib cocks, Bib taps, Surface boxes, Ferrule boxes, Ferrule cocks, Foot valve, Pushes cocks, Steam cocks, Stop cocks, Waste-not valve, Wheel valve, Shower roses brass, Iron bedstead and fittings, Sluice valve caps, Check valve, Clips pipes, Gully traps, Inspection cover, Manhole cover, Gratings.

Steel Work:—Steel tanks, Cranes, Haulage gear tanks, Iron tanks, Cisterns, Ordinary tanks of all types, Water lorries tanks, Signal posts and Brackets, *Fabrication of light structure*, steel gate, spiral stair-cases.

Electrical:—Plugs and Sockets, Bracket for external lighting fixture, Clips, Clamps for pole, earth—Post and Telegraph line materials, *i.e.*, socket for poles, sole plates for poles.

Pumping plant:—Lift and force pump, Rotary and Semi rotary pump, Tubewell pumps.

Tools:—Punches, Grinding wheels, vices, Travelling wheels, Stand for vices.

Nuts & Bolts:—Manufacture of M. S. and non-ferrous metal Nuts and Bolts, Rivets, Washers, Fish Plates, Dog-spikes, Tie bars, Hammer, Hooks, Axes, Shovels, Rammer and Kodalies.

Their capacity of production is about 20 tons a day and they employ on an average about 200 workers.

Future Outlook:—Before the war Messrs. D. N. Singha & Co., were manufacturing primarily for the civilian market but during the war they had considerably diverted their production to meet the war demand in different spheres. They are first-class manufacturers of sanitary requirements in the country, and hope to revert to that line now that the war is over.

Messrs. Dolohar Ltd.

Managing Agents: Messrs. Ohdedar & Co. *Office & Works*: Bhupen Roy Road, Behala (24 Parganas). *Telephone*: Head Office: South 1658, City Office: Cal. 5186, *Telegrams*: DOLOHAR, Calcutta.

The firm was started in 1939 and is engaged in the production of Small tools and workshop equipment.

Dutson Engineering Corporation Ltd.

Managing Agents: Messrs. Subol Dutt & Sons Ltd. *Office*: 4, Clive Ghat Street, Calcutta. *Works*: 5, Mohendra Chandra Garden Road, Ghugudanga, P. O. Dum Dum.

This private Limited Company was established on the eve of the war in 1939 and is located in Dum Dum near Calcutta. They are engaged in the manufacture of Tools and Small Machinery.

The Electrical Fan & Motor Mfg. Co., Ltd.

Managing Director: Lala Shivraj Bhalla. *Office & Works*: Grand Trunk Road, Shahdara, Lahore. *Telephone*: *Office & Works*: 4136, *Telegrams*: ELFAMCO.

Introduction:—In the field of Engineering Industries, particularly electrical engineering, the Electrical Fan & Motor Mfg., Co., Ltd., Lahore are the pioneers in Northern India. A decade back *Elfa* started as a pioneer for the manufacture of electrical fans and motors in the Punjab.

Beginnings were modest. *Elfa* started with a small factory in Shahdara by the side of the Ravi bridge. In 1937 its authorised capital was Rs. 2,50,000, the paid-up capital being Rs. 1,05,000 only. The progress made in the very first year was quite encouraging. The tempo and quality of its production increased in the years that followed. In the year 1942-43 their

output amounted to several lakhs of rupees. Therefore, corresponding to expansion in production, the capital was also raised in 1943 to Rs. 10,00,000 as subscribed and paid-up.

Manufactures :—The Electrical Fan & Motor Mfg., Co., Ltd., manufacture to-day ceiling fans, electrical motors, exhaust fans, and pedestal fans which is their speciality. They can manufacture about 10,000 ceiling fans per month.

During the war their entire production was reserved for the Government of India. So long as the emergency was there, *Elfa* maufactured and supplied to the Civil Defence Department electrical sirens for use by the A. R. P. personnel.

The factory employs about 1000 labourers. The Electrical Fan & Motor Mfg., Co., can look to the future with confidence, thanks to the foresight of their Managing Director, Lala Shivraj Bhalla. To-day "*Elfa*" is a house-hold name in the Punjab.

The Engineering Works of India, Limited.

Managing Director: Mr. G. K. Gidwani. *Office*: 46, Central Avenue, Calcutta. *Factories*: (1) 20, Ultadanga Road, Calcutta, (2) 98, Raja Dinendra Street, Calcutta. *New Factory*: 224, Grand Trunk Road, Howrah, *Branch*: Karachi: *Selling Agents*: All Over India. *Telephone*: Office: B. B. 5632, Works: B. B. 4534. *Telegrams*: ENGWORKCAL.

Introduction :—The Engineering Works of India Limited is one of those few enterprises that with humble beginning developed into a full-fledged modernised factory in a very short time by dint of sheer scientific management, and wise guidance.

Activities :—It started as an enterprise undertaken by a group of energetic persons who actively participated in war industry in 1443-44 in the shape of handling fabrication of press work and intricate machining and large scale building operations. In the middle of 1944 steps were taken to develop its electrical side and fully modernised equipments were assembled in a very short time. The company took up manufacturing

electrical amenities of life such as Fans, Coolers, etc. Its champion product "Phoenix" fan has already established a name in the Indian Fan World by virtue of its high scientific precision and efficiency. "Phoenix" (1946) model embraces all the excellence of manufacture that is possible and available to scientific research and technical skill. In a word, engineering methods and materials have collaborated to manufacture this super type of fan.

Future Outlook: In the post war re-construction the Company promises to loom large in India's Electrical Engineering field. Very rapidly it is expanding. Keeping in view the motto 'Better standard of living for All' the Company is assembling new machineries in its new factory at Lillooah—one of the biggest and up-to-date Engineering Works of the country to produce various articles of amenities on a large scale bringing them within the easy reach of all for comfort and relief.

Messrs. Garlick & Co., Ltd.

Proprietor: Mr. A. E. Maskati. *Office & Works*: Haines Road, Jacob Circle, Bombay. *Telephone*: 42071, *Telegrams*: GARLICK, Bombay.

Introduction:—The Company was established as early as 1872 by an Englishman, Mr. Garlick by name. The business of the Company then consisted of selling hardware tools, mill stores and machineries and undertaking water works and structural engineering contracts. The well-known Garlick Flooring Tiles, made out of cement in various colours, stood out as an outstanding achievement in its various lines of manufacture. They were the sole patentees of Garlick Patent Stone Flooring invented by Mr. William Moir, an Engineer of the firm. After the death of Mr. Garlick the Company went into the hands of his son Mr. Christiansen. It was during his time that the Company was shifted to its present site at Haines Road, near Jacob Circle where the works now cover an area of over 22,000 square yards and its activities have been considerably widened. When in 1908, Mr. Christiansen went back to his

own country the concern was taken over in joint partnership by Messrs. Ambalal Sarabhai, A. E. Maskati and G. A. Latif. This partnership continued till about 1914 when Mr. Maskati took over the whole concern and raised its capital investment from 400,000 to 30,00,000 of rupees.

Activities :—Since then the range of their activities has considerably widened and to-day they are capable of undertaking the following :—

(*a*) Equipments for Oil Refinieries and Vegetable Factories.

(*b*) Spherical Rotating Digesters and other equipments for Paper and Straw Board Industries.

(*c*) Kiers, Vacuum Pans, Filter Presses, high speed Juice Heaters, Magma Pumps, Chrushers, etc., for the Textile, Sugar and Soap Machineries Industries.

(*d*) Fabrication and erection of Steel Bridges, Buildings, Factories, etc., etc.

(*e*) Road making, water-proofing, cement and tiles manufacturing.

(*f*) Municipal requirements, such as Hydrants, Valves, C. I. specials, watering carts, etc.

(*g*) Structural Works.

Labour :—The Company employs about 600 men in its various departments which comprise :—

1. Foundry & Pattern Shop.
2. Machine Shop.
3. Boiler & Heavy Structural Shop.
4. Light Structural Shop.
5. Ashphalt Products & Paint Manufacturing.
6. Cement Flooring Tiles.
7. Smithy Shop.

The Foundry has 2 cupolas and can undertake castings of any nature upto 5 tons in weight.

The jobs carried out in the machine shop and structural departments are varied in nature, but the following give a general idea of the work carried out:

1. Mild Steel, plain or jacketted pressure, of vacuum vessels.
2. High Pressure autoclaves such as Pulp Digesters, for Paper Mills, Boiling Kiers for Textile Mills, etc.
3. Small Autoclaves and vessels for Industrial and Scientific Research, etc.
4. Machining, and casting of gear wheels, machinery parts, water works fittings and other special castings both ferrous and non-ferrous.
5. Bridges, Steel framed buildings for factories, Cinemas, etc.
6. Electric Welding of all mild steel structures and vessels under direct supervision of foreign trained Indian Experts.
7. The designing and installing of Refrigeration Equipments for all Cooling Requirements.

The Company has also an Agency Department and represents over 20 English and American and Indian Firms.

Messrs. Godrej & Boyce Mfg. Co., Ltd.

Managing Director: Mr. P. A. Godrej. *Office & Works*: Lalbag, Parel, Bombay. *Cal. Office*: 102, Clive Street, Calcutta. *Telephone*: 42047, Cal. 1407, *Telegrams*: GODREJSAFE.

Introduction:—The establishment of the Company dates back to the year 1896 when it was started to manufacture pad-locks. Manufacture of Godrej Safes and Cabinets was taken up in 1902. A number of innovations and improvements in the design and construction of the safes have resulted in the

production of fire-proof safes for which Godrej are now famous all over the country.

Manufactures :—The articles of their manufacture include Safe-cabinets, Almirahs, Steel Shelving, Shelving Cup-boards, Filing and Card Cabinets, Hospital equipment, Office and Home furniture in tubes and sheet metal, and Padlocks. Most of the articles of their manufacture were introduced in the country for the first time by Godrej. Heavy safe deposit equipment with massive strong doors (proof against explosives), electric drill and hammer and oxy-acetylene cutting flame, and patented Safe-Deposit Locker Cabinets are the proudest achievements of Godrej engineering skill and workmanship. To-day no less than 24 patents stand to Godrej's credit. Almost all the Safe-Deposit Vaults—over a hundred, and comprising those of the Reserve, the Imperial and all the other big Banks, the Mint, and of Safe-Deposit companies—all over the country are Godrej. These invulnerable Vaults which withstand all modes of attack including the Oxy-Acetylene blowpipe, and the innumerable Renters Safes of the Safe-Deposits are securely on Godrej Patent Methods.

The Storage Racks and Steel Cup-boards in the new Government Secretariat Offices in New Delhi are the work of this steel equipment manufacturing Co.

Present Position :—Initially when this Company came into being it was run with barely half a dozen hands. To-day the Company employs a works force of more than 2,000 and an administrative and sales staff of about 250 people spread all over India and has a sales organisation comprising two Show Rooms in Bombay, five branches and 17 agencies. They have already entered into selling agency agreements for overseas countries comprising Iran, Iraq, England and the continent of Europe, China, Malaya, Burma and Ceylon. Their manufacture ranges from the biggest combination for massive strong room doors to the most delicate locks for Jewel cases.

Future Programme :—Besides expanding its production in its regular lines, the Company also intends to introduce new lines of production such as refrigerators and type-writers etc. It has proposals for its selling agencies for countries comprising

Palestine and Syria, Egypt, East and West Africa and Australia.

The Company has already bought a very large area of land in the suburb of Bombay where it is proposed to shift the Works in the immediate future. A large quantity of plant and machine tools has already been ordered. It is hoped that plants for the manufacture of steel tubes, refrigerators and typewriters will ere long be set up.

G. T. R. Company Ltd.

Managing Director: Mr. S. B. Dutt. *City Office*: 6, Clive Street, Calcutta. *Works*: 37, Dum-Dum Road, Calcutta. *Telephone*: Dum Dum 76, *Telegrams*: "MERIDIAN".

Introduction:—Established in 1918 the Company was under European management till 1928 when it passed into the hands of an eminent Indian Industrialist the late Mr. R. R. Sinha.

Before the war, as Hydraulic Engineers the Company gained reputation through the length and breadth of the country. There was considerable demand for its products from almost all important institutions in India and the Government. The country till then depended for all kinds of Water, Gas, and Steam Fittings almost entirely on outside supply. The company successfully competed with the imported goods and established its reputation. To-day G. T. R. products find favour with Railways.

During the world War No. II the services of the G. T. R. Co. were requisitioned by the Government and the entire production was taken over by the Defence Department. Water Fittings, Petrol Fittings, Steam Fittings in thousands were manufactured during the War period and last but not the least the company supplied substantial quantity of electric fans and Stirrup Pumps etc. to the Defence Department.

Present Position:—At present the factory is in a position to produce 150 fans a day along with other items of production. The company diverted much of its attention during the War

period to electrical side chiefly to the manufacture of electrical motors, electrical fans and electric pumps etc.

Labour :—More than 400 labourers are employed in the factory. 60% are of them are skilled and 40% unskilled.

Harbans Lall Malhotra & Sons Ltd.

Managing Director: Lala Harbans Lal Malhotra. *Office*: 11, Clive Street, Calcutta. *Works*: 16, Dum Dum Road, Calcutta. *Telephone Office*: Cal. 4124 *Works*: B.B. 6618, *Telegrams*: TUBFURN.

Introduction :—The factory was started in 1941 with the object of manufacturing engineering equipment for meeting the war demand. Now it has expanded considerably and is manufacturing a number of items. The latest additions to the factory are the "Tubilite furniture" and "Chirag" lamp sections.

Manufactures :—

(1) *Automobile*.—This section mainly deals with the repairs of automobiles and comprises of the repair lines, body-building lines, Engine re-boring lines, welding and smithy line and spray painting section. Work by this section has so far been carried out only for the Government but the section is very well equipped to deal with all sorts of civilian requirements.

(2) *Tubular Steel Furniture*.—This is the latest addition to the workshop and is producing "TUBILITE" furniture on a mass scale. This section is equipped with the latest types of machines. Every job is very thoroughly inspected before it is released for the market.

(3) *Hurricane Lamp*.—This section has been started very recently and it is hoped that the products will be put in the market in the near future.

(4) *Foundry* (*C. I.*).—Capacity 180 tons per month. This section was so far being used mainly for maintenance, but now a plan for the manufacture of Machine Tools is being worked out.

(5) *Machine Shop.*—The machine shop is well equipped with most modern machinery and is at present mainly used for the operational jobs on the manufacture items and maintenance.

(6) *Saw Mills.*—This section did tremendous work during the war and has now been switched on to Railway and Civilian work.

Messrs. Hazra Engineering Works.

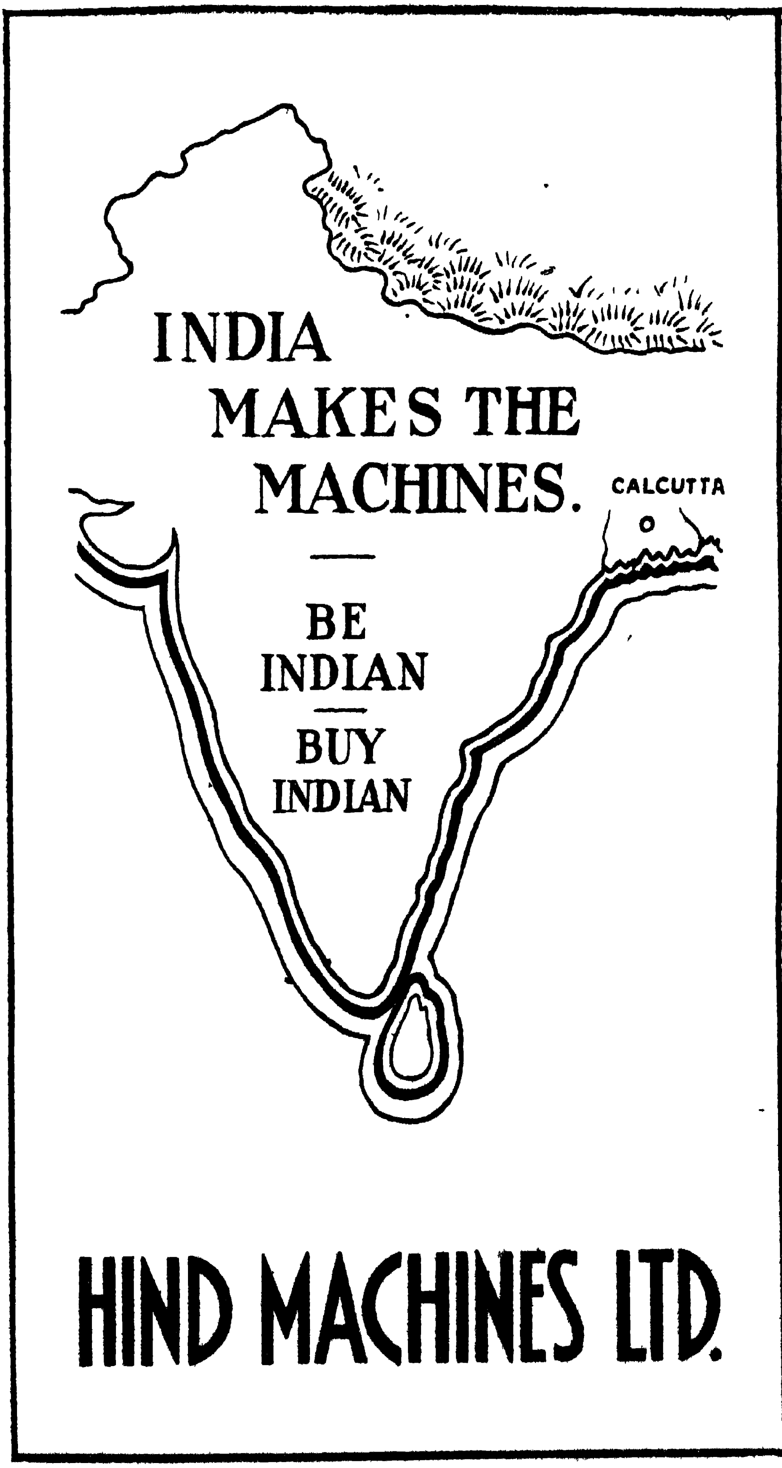
Managing Director: Mr. A. Hazra. *Head Office*: 13, Rani Rashmoni Road, Calcutta. *Works*: 67, Nursing Dutt Road, Howrah. *Telephone*: *Office*: Cal. 4780, *Works*: Howrah 543.

Introduction:—The firm of Messrs. Hazra Engineering Works was founded in 1942. It was started with a modest beginning and was engaged only in the manufacture of smithy works.

Later Developments:—In December, 1942, the firm installed a few lathes, grinding, drilling and shaping machines and extended the Smithy Shop and started tin smithy and iron moulding shops. The number of workers employed at this stage totalled about 60.

The firm was soon registered as an approved contractor to the Department of Supply, New Delhi. During this period the firm received large Government orders and to cope with this increasing activity the number of labourers had to be increased to about 225.

Conclusion:—The firm is a first-class contractor to the Government and has earned good repute for execution and despatch. Now that the war is over, the difficulties so far experienced would go and the firm will cater to the civilian demand.


INDIA
MAKES THE
MACHINES.
CALCUTTA
BE
INDIAN
BUY
INDIAN
HIND MACHINES LTD.

Messrs. Hind Construction Ltd.

Managing Agents: Messrs. Birla Bros. Ltd. *Head Office*: 8, Royal Exchange Place, Calcutta. *Telephone*: 3841, *Telegrams*: HINDNIRMAN.

Introduction:—Messrs. Hind Construction Ltd. have adequate financial resources to handle even big structural undertakings and have for this purpose a qualified, competent and experienced staff of engineers. They use the most up-to-date methods and mechanical equipment.

Jobs:—They undertake the construction of engineering structures such as factories, bridges, dams, roads, railways, canals etc.

They also undertake engineering and architectural design work and supply necessary advice on engineering and technical problems.

Present Position:—They have wide connections both in the U. K. and the U. S. A., the benefit of which, through them, can always be available to the Government and Industry. They have branches at Delhi, Jaipur, Gwalior etc., and they propose to extend their activities to the whole of India.

The Hind Cycles Ltd.

Managing Agents: Messrs. Birla Brothers Ltd. *Office*: Imperial Bank Building, Bank Street, Fort, Bombay. *Works*: Worli, Bombay. *Telephone*: *Office*: 127046, *Works*: 42097 (2 lines), *Telegrams*: *Office*: LUCKY, *Works*: CYCLEHIND.

Introduction:—This company for the manufacture of cycles and cycle parts was promoted in the year 1939 under the name and style of India Cycle Ltd. which was later on changed to Hind Cycles Ltd. It was started with an authorised capital of Rs. 50 lakhs of which Rs. 15 lakhs represented subscribed and paid-up capital.

Manufactures:—The factory manufactures complete bicycles of 22″ and 24″ which are the most popular sizes in India. The pattern is that of English Cycles like Hercules, Raleigh and B.S.A. A complete cycle has 196 parts out of which Hind Cycles are manufacturing everything except free-wheels, chains, spokes, nipples and steel balls.

Labour:—The number of labourers employed is between 700 and 1,000 depending upon the supply position of raw materials.

Future Outlook:—The Bicycle Industry has been found to be well-established and the Government have accepted the recommendations of the Tariff Board and granted protection to it which will remain in force till March 1949. They have agreed to grant certain facilities also in the matter of imports of necessary machinery for the manufacturers but have at the same time laid stress on the need for research for which allocation of a certain sum by the manufacturers has been made a condition to the grant of protection. As there is a vast scope for the industry in the country, it is expected that the firm will have a bright future.

Hind Machines Ltd.

Managing Director: Mr. B. S. Gupta. *Regd. Office & Factory*: 184, Jogendranath Mukherjee Road, Salkia, Howrah. *Office*: 7, Clive Row, Calcutta. *Telephone*: *Office*: Calcutta 2830 (2 Lines), *Works*: Howrah 1017, *Telegrams*: *Office*: HINDMASHIN—Calcutta, *Works*: HINDMASHIN—Howrah.

Introduction:—Hind Machines Ltd. were started in 1941 and possess one of the most modern workshops in India to produce modern Machine Tools and Industrial Machinery.

The Company has an authorized, issued and subscribed capital of Rs. 25,00,000/- and paid-up capital of Rs. 14,50,000/-.

Manufacture :—The following are the main items of their manufacture :—

(1) *Machine Tools.*

(*a*) Universal Milling Machines.

(*b*) Radial Drilling Machines.

(*c*) Pillar & Bench Drilling Machines.

(*d*) Bolt Nut Plants.

(*e*) Wood Working Machines.

(*f*) Hydraulic and Mechanical Presses, etc.

All machines conform to grade I standards and are equal in quality, material and workmanship to any of the imported products.

(2) *Special Tools*:

Precision Dies, Jigs, Fixtures etc., and special tools for mass production works. It may seem strange but they have been successful in manufacturing tools to the accuracy of .00005″

(3) *Structural Steel Works*:

Railway Wagons, Tanks, Haulage equipment, Cranes, Steel Work for factories, buildings, collieries, Jetties, Steel Doors and Windows, Carts of all sizes and descriptions, etc., etc.

(4) *Industrial Machinery*:

Entire plants for:
Jute Mills
Sugar Mills
Cotton Mills
Oil Mills.

(5) *Castings*:

Ferrous Castings upto 15 tons individual weight, Non-ferrous castings upto 10 cwt. individual weight, Steel Castings upto 5 tons individual weight.

Present Position :—The present monthly production of the factory is approximately 100 Nos. of average size Machine Tools, 500 tons of Structural Steel Work, 600 tons Iron Castings, 50 tons Non-ferrous Castings. Steel Castings plant is expected to start early next year when production is expected to be about 100 tons a month. They are capable of equipping entire Jute or Cotton Mill of about 5,000 Looms in a year.

The number of workers employed is about 1,000 of which 700 are skilled.

The Hind Tank Mfg. Co.

Managing Director: Mr. K. T. Shah. *Office & Works*: 6th Kumbharwada, Bombay—4, *Telephone*: 42429, *Telegrams*: INDUSPLANT.

Introduction :—The Hind Tank Mfg. Co., Bombay, was started in 1915 by the Late Mr. Gangadas Dayabhai Shah and Mr. Tricumdas Kuberdas on a modest scale with a capital of Rs. 5,000/-. In the beginning the machinery was worked by hand. To-day the Company has an electric power workshop with a spacious yard and engages more than 100 skilled workers.

Manufacture :—The Company principally manufactures the following :—

(1) Water Tanks of various capacities; (2) Night-Soil Tanks, (3) Water Carts, (4) Work-shop Chimnies, (5) Oil Tanks etc.

Uptil now the Company has supplied over 2,500 tanks to various municipal bodies and the orders are daily increasing. It is creditable that no complaints have ever been received regarding the tanks supplied by this Company. Besides supplying big chimnies to various mills and workshops, the Company has also manufactured tanks from Stainless Steel for storing gases and chemicals to withstand a pressure of more than 500 lbs.

Recently the Company has added an electric welding plant. As costly materials and the best electrodes manufactured in England are used for welding, the welding work done by this Company is found to be very satisfactory. The success is also due to the fact that the welding work is done under the supervision of a highly technical expert with a precise knowledge of the correct pressure of electric power to use in welding iron sheets of different thickness etc.

The Company is supplying tanks etc. to such reputable firms as Messrs. Turner Hoare & Co., Messrs. Richardson Crudas etc. The Welding Department has also executed several orders for repairing broken parts of machinery from several mills in Bombay.

As far as possible, the Company uses Indian materials. It imports other materials of the best quality from reputed foreign firms.

Conclusion:—The Hind Tank Manufacturing Co. is one of the first class industrial plant and heavy machinery manufacturing units of the country and with its vast experience and efficient management has an assured place in the post-war industrialization scheme of the country.

Messrs. Hind Screws.

Proprietors: (1) Mr. Ramlal, (2) Mr. Brijlal. *Office & Works*: Birla Lines, Subzimandi, Delhi. *Telephone*: 8247, *Telegrams*: SCREW.

Hind Screws is a private firm started in 1944 with a capital of Rs. 1,50,000 when supply of imported screws had been entirely stopped due to war. As foreign machinery was not available the promoters were obliged to fabricate machinery in their own workshop which, however, has been working satisfactorily. The quality and workmanship of their screws has been found to compare favourably with foreign screws. In addition to the screws they manufacture rivets also.

Recently they have started manufacturing Lanterns and Burners of tin and brass both the demand for which is so great that they find it difficult to meet the entire demand particularly due to shortage of brass and tinplates.

They have plans to expand their activities further by taking up the manufacture of Hurricane Lanterns of which there is a great demand in the country.

More than a hundred men are employed in the factory.

Hindustan Abrasive.

Proprietors: Mr. D. N. Sahay, Mr. R. P. Sinha. *Office*: C/o. South Bihar Sugar Mills Ltd., Bihta (E. I. R.). *Telephone*: Dinapur 30, *Telegrams*: CANESUGAR, Bihta.

Messrs. Hidustan Abrasive came into being in 1943. They are engaged in the manufacture of Sand Paper, and Sand Cloth.

The Hindustan Bicycle Mfg. and Industrial Corporation Ltd.

Managing Director: Rai Bahadur Shyam Nandan Sahay. *Calcutta Office*: 9, Clive Street, Calcutta. *Works & Office*: Phulwari Shareef, Patna. *Telephone*: *Office*: Calcutta 5977, Patna 23, *Telegrams*: IBAGENCIES Calcutta, BIKE, Phulwari Shareef.

Introduction:—The Hindustan Bicycle Mfg. and Industrial Corporation Ltd. came into being in the year 1939. But the actual production started in the year 1940.

Manufacture:—They manufacture complete bicycles. The quality of the bicycles manufactured in this factory has been approved by the Government. Their productive capacity is about 200 cycles per day which can be increased to 280 cycles with further additions to machinery and equipment. The

Hindusthan Bicycle, beside other parts, make spokes, nipples, and also tubings. For sometime, they supplied spokes and nipples to the Hind Cycle Works of Bombay before the latter began their manufacture. They only import free wheels, chains, and steel balls.

As regards accessories for bicycles, like bells, pumps, equipment tools, tool bags, oil cans, reflectors, luggage carriers with stand, etc. they are all being manufactured by them and are approved by the Government.

The Hindustan Construction Co., Ltd.

Managaing Agents: Messrs. Walchand & Co., Ltd. *Head Office*: Construction House, Ballard Estate, Bombay. *Telephone*: 26036, *Telegrams*: HINCON.

The Hindustan Construction Co., Ltd., is another enterprise of the famous business house of Messrs. Walchand & Co., Ltd. They work as Constructional Engineers throughout the country.

The Hindustan Metal Refinery & Rolling Mills.

Proprietor: Mr. Himchand K. Shah. *Office*: 124, Mint Street, G. T. Madras. *Works*: Tondiarpet. *Telephone*: 2535, *Telegrams*: ROLLINGMILL.

This private concern was established only recently in 1945 and is engaged in rolling and refining of metals of every description.

The Hindustan Motors Limited.

Managing Agents: Messrs. Birla Brothers Ltd. *Registered Office & Works*: Okha, Baroda State, Kathiawar. *Calcutta Office*: 8, Royal Exchange Place, Calcutta. *Telephone*: Calcutta 562 and 567, *Telegrams*: HINDMOTOR.

Introduction:—The Hindustan Motors Ltd. is one of the two companies in India started for the manufacture of automobiles. It was incorporated in 1942 with an authorised capital of Rs. 20,00,00,000 of which Rs. 5,00,00,000 is paid up.

Activities:—The object of the company is to carry on the business of cars, trucks, chassis, motors, cycles, also planes, engines, tanks, ships, boats, accessories, buses, and lorries etc. in India.

Recent Development:—Recently they have concluded an agreement with Nuffields Organization in England. Under the terms of the agreement the Hindustan Motors Limited have now secured expert technicians from them who have already arrived in India, and are going ahead with the scheme. They have put in the market "Hindustan 10" which is their first car for the Indian market.

Future Outlook:—In the post-war period with further industrialisation and growth of internal trade, construction of new roads and higher standard of living it is expected that the demand for cars would go on increasing and the industry which is just in its infancy will soon be established.

Hindustan Wire & Metal Products Ltd.

Managing Agents: Messrs. Associated Industrial Development Co., Ltd. *Chairman of the Board of Directors*: Mr. G. K. Khemka. *Office*: "Stephen House," 4, Dalhousie Square, East, Calcutta. *Works*: Mulajore, *Via*. Shamnagar, B. A. Rly. *Telephone*: *Head Office*: Cal. 5660 (6 Lines), *Factory*: Bhatpara 32,33,34, *Telegrams*: EXPAMETAL, Calcutta.

Introduction:—The Hindustan Wire and Metal Products Ltd. was registered in 1943 and has a paid-up capital of

Rs. 15,00,000. This enterprise was launched by Mr. G. K. Khemka, a well-known industrialist with the object of manufacturing Expanded Metal. The plant was provided by the Government of India which they had imported from America.

Manufacture:—The plant has the capacity to manufacture Expanded Metal to American Specification to the extent of 100 tons per month by one shift working

Future Outlook:—On account of its varied uses it is expected that the demand for expanded metal will increase considerably in the post-war period and as such the firms engaged in the manufacture of expanded metal have an assured future.

The Howrah Trading Co., Ltd.

Managing Agents: Messrs. Soorajmull Nagarmal, Calcutta. *Head Office*: 8, Dalhousie Square East, Calcutta. *Factory*: 62/D-2, Jogendra Nath Mukherjee Road, Howrah. *Telephone*: *Office*: Cal. 2875, *Factory*: Howrah 45. *Telegrams*: SOORATRADE.

Introduction:—Howrah Trading Co., Ltd., was started with two major objectives in view, (1) production of textile machinery in India and (2) building of boats. Much Progress could not be made with the manufacture of textile machinery and the building of the boats on account of the sudden outbreak of the war.

War Time Activities:—During the war the work-shop was transformed into one for the manufacture of materials to meet the war demands. They have manufactured for the Supply Department to their satisfaction Jigs and Tools, Coal Tubs, Stirrup Pumps and Fire Extinguishers, Engine Stand, Picket Angles, Jim Crows, Mortar Bomb Cases, Endless M. S. Chains, Wheels & Axles, Brackets, Road Roller Shells, Roller Bearing Transposition Stalks, Spindles, Plugs, Cotters, Washers, Thornily Brackets, Loom Crank Shaft, Light Pile Driver, Chainless Cotters, Saddle Struts, Pegs Pickting,

Looms, Pully Blocks, M.S. Nuts, Assembly Clips, Sliding Doors, Pilt Shoe, Sigging Screws, Single Posts, Sockets, precision instruments and many more odd varieties as have emanated form time to time from the Department of Supply, Government of India under the war supply scheme or otherwise.

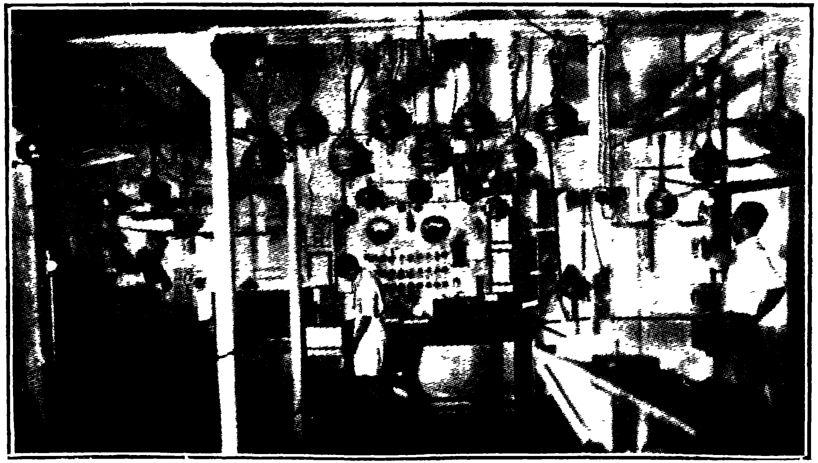
Future plans:—Now that the war is over they are looking forward to fulfil their original objectives of establishing plants for the manufacture of textile machinery and thereby making it possible for the textile industry of the country to get its requirements in India instead of looking beyond the seas for its day to day necessaries.

In the matter of boat building India still lags behind not only the maritime nations like England, Norway, U. S. A., but also other countries which have found out that the prosperity of a country depends very largely upon in-land, coastal and high sea shipping. Therefore for this purpose they want immediately to start building of boats and with that end in view large tracts of land have been acquired by them on the Hooghly to set up plants. Their workshop is very efficiently and sufficiently equipped to take up the manufacture of the machinery side of the boats. Now that the war is over, they are contemplating to proceed with their scheme without further delay.

The Hyderabad Brass Products Ltd.

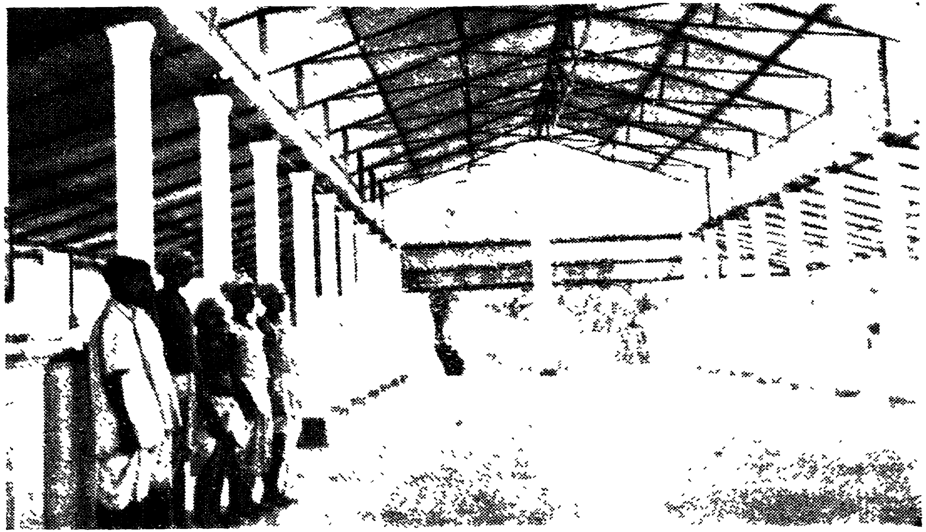
Managing Agents: Messrs. Munshi Ram Dusaj & Co. *Office*: 15, Jerra, Secundrabad, Deccan. *Works*: 21/2, Industrial Area, Azamabad, Hyderabad, (Deccan). *Telegrams*: EXCELLED, Hyderabad, (Deccan).

Manufactures:—They manufacture brass sheets, cycle parts, rods, pipes, utensils and other non-ferrous metal products such as brass cock, wheel, aluminium and copper utensils, etc.



Testing Department

India Electric Works Ltd.



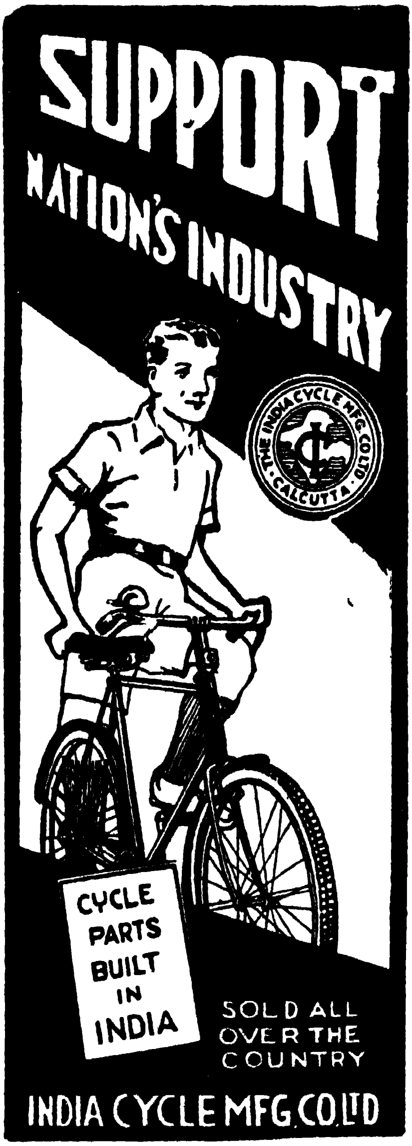
Inside view of the Canteen

India Electric Works Ltd, Behala

The India Cycle Mfg. Co., Ltd.

Director-in-Charge: Mr. I. C. Gupta, M.Sc., F.I.C. *Office*: 4, Clive Ghat Street, Calcutta. *Works*: 9, Tiljala Road, Calcutta. *Telephone*: *Office*: Cal. 6955 and 6956, *Works*: PK. 2235, *Telegrams*: INDCYCLE.

Introduction:—The India Cycle Mfg. Co., Ltd., was registered as a Private Limited Company in March, 1938. In October of the same year it was converted into a Public Limited Company with an authorised capital of Rs. 10,00,000.



Manufactures:—The Indian Cycle Mfg. Co., Ltd., manufacture Cycle Components and Accessories such as "INDIA" brand Bell, Lamp, Pump, Carrier, Forks well known all over India. During the war, the factory was engaged in the production of Munitions Stores and Scientific Instruments components.

The Factory is well equipped for production of accurate Die and Sheet Metal work.

Future outlook:—The India Cycle Mfg. Co., Ltd. is one of the three cycle manufacturing Compaies in the country and has so far been engaged in the production of Components and assembling Cycles with these components.

The India Electric Works Ltd.

Managing Director: Mr. B. K. Rohatgi. *Head Office*: Diamond Harbour Road, Behala, 24 Parganas. *Factory*: (1) 25, South Road, Entally, Calcutta, (2) 6, Diamond Harbour Road, Behala, 24 Parganas. *Telephone*: (*i*) PK. 46, (*ii*) South 2620 (3 lines), *Telegrams*: MANUFACTER.

Introduction:—The firm was first started under the name and style of Scientific and Electrical Instruments Mfg. Co. in 1921. Later on when in 1924 they took up the manufacture of electric fans its name was changed to the India Electric Works. They are the pioneers in the field of fan industry and had to encounter all the difficulties of a new enterprise.

Manufacture:—All the parts right from the tiniest nut to the especially curved aluminium blades are manufactured by the factory itself. In 1930 the company was changed into a limited concern, capital investment was increased and the manufacture of all sizes of A. C. and D. C. ceiling as well as table and pedestal fans was taken up. They erected another factory at Behala in 1939. Their output has increased from 10 fans per day in 1930 to 300 fans now which are selling under a number of brands in the market of which '*India*' '*Rohtas*', '*Bharat*', '*Ranjit*' and '*Tara*' are most notable. Their old factory at Entally is now engaged in the manufacture of telephone and telegraph instruments, railway signalling, interlocking apparatus, pole fitting apparatus, electric kettle, electric irons, bakelite electrical fittings and fine and delicate measuring and other types of scientific instruments whereas that at Behala is manufacturing fans only.

Labour:—There are about 2,000 workers in both their factories.

Research Department:—The Company maintains a Research Department where experiments by qualified technical people are always being carried on. During the war time in its Chemical Laboratory the Company experimented on the manufacture of Carbon Brush, Synthetic Paint and its recovery, Leatheroid, Empire Cloth and other insulating materials and



Outside view of the Canteen

India Electric Works Ltd.

successfully made some of them. They were successful in making and developing a very good pilot plant of modern type for Empire Cloth from which a very large quantity of this material was made for use in the manufacture of fans.

Experiments on the design of Switch gear and Starters were also made very successfully in the factory Laboratory. Other experiments are also being carried on to keep the products of the Company up-to-date.

Post-War Schemes :—The Company has decided to take up the manufacture of all sizes of Electric Motors and Dynamos, Starters, and Switch Gears, Refrigerators, Air-conditioners and Transformers. The Company has already completed the designing of some of the sizes of motors and starters. Their tools are ready and these products will soon be in the market.

India Engineering Works Ltd.

Managing Agents: Messrs. Mohatta & Agarwal. *Office*: Chandni Chowk, Katra Asharfi, Delhi. *Works*: Roshanara Road, Delhi. *Telephone*: 6276 *Telegrams*: KAPDEWALA.

Introduction :—The India Engineering Works Limited were established four years ago as a limited company with a paid-up capital of Rs. 1,50,000.

Their factory, besides a well equipped workshop, has 8 power presses, 1 power hammer and 7 hand presses with capacity from 2 to 30 tons.

Manufactures :—Their manufactures are the following :—

(1) Tower bolts from 3″ to 12″.
(2) Hasps Padlock of various sizes (German Pattern).
(3) Spring type steel locks.
(4) Chest and door handles.
(5) Steel belt fasteners.
(6) Steel Optical cases.
(7) Steel Hinges from 2″ to 16″.

They employ about 100 workers on an average.

The India Machinery Co., Ltd.

Managing Agents: Messrs. Dass Brothers. *Office*: 29, Strand Road, Calcutta. *Works*: Dassnagar, Howrah, *Telephone*: *Office*: Cal. 3385, *Works*: Howrah 532, 565 Howrah; *Telegrams*: MARVELLOUS, Calcutta, ATLAWBRIZ, Howrah.

Introduction:—The Company was formed generally for the purpose set out in the Memorandum of Association of the Company, and particularly with the object of acquiring and carrying on the business hitherto carried on by Messrs. Atlas Weighbridge & Engineering Co., and Messrs. Pal's Engineering Works Ltd.

The Company was registered in August 1937 and since then has been engaged in manufacturing the following items, *viz.*, Machine Tools e.g. Slotting Machine, Screw cutting Lathes, Plaining, Drilling, and Shaping machines; Railway, Lorry Cart, Weighbridges and Platform and other Weighing Machines, Weighers; Cotton Mill Looms and Jute Mill Machinery. The Company has an up-to-date Machine shop and a big Foundry.

The subscribed capital of the Company is at present Rs. 17,50,000/- and engages besides an efficient staff, workers numbering 800 on an average daily.

Present position:—The Company is the only manufacturer in India of Grade I Slotting Machines and other Machine Tools and has been suplying to its utmost capacity to the Government and Industrial concerns spread all over India.

Management:—The Board of Directors consists of efficient persons well known in the country. They expect to manufacture items which were so long being imported from abroad.



Mr. Sunderdas, the Mg. Director of the Indian Clock Mfg. Co., Ltd., is seen reviewing the progress of the Company while Welcoming Deshratan Dr. Rajendra Prasad on the occasion of his visit to Sundernagar on 28th October, 1945.



Dr. Rajendra Prasad is seen addressing a distinguished gathering at Sundernagar.

The Indian Clock Mfg. Co., Ltd.

Managing Agents: Messrs. Sunderdas & Sons Ltd. *Office & Works*: Sundernagar, Jamshedpur. *Telephone*: 86A *Telegrams*: SUNDERDASCO.

Introduction:—The firm was started in 1941 with the object of manufacturing clocks. The industry being new to the country requiring considerable technical skill to handle precision mechanism, the company had to take special pains to give training to the workers and make them skilled. The workshop was originally located in a rented building at Jamshedpur. With the gradual expansion of their works and activities they acquired 500 Bighas of land from the Dalbhum Raj Estate and erected their new factory at Sundernagar which they have schemes to convert soon into a modern, clean, and healthy industrial centre. The foundation stone of the Guest House was laid by no less a distinguished person than Dr. Rajendra Prasad after whom it has been named as Rajendra Bhawan.

Upto this time they have been working with automatic machines manufactured in their own factory but they are going to be replaced soon by new and up-to-date machinery imported from the U. S. A. and Switzerland.

Manufacture:—With their new equipment they will soon be manufacturing time pieces and watches in addition to the clocks. They have also taken up the manufacture of gramophone needles of various types and paper clips etc.

They also contemplate to take the manufacture of springs of various kinds besides those which would be required for the watches and clocks etc.

At present about 600 workmen are working in the factory.

Indian Enamel Works Ltd., Bombay.

Managing Agents: Messrs. Amritlal & Sons Ltd. *Head Office*: Great Social Building, Sir Pherozshah Mehta Road, Fort, Bombay. *Factory*: Kasturchand Mills Compound, Dadar, (B. B. C. I.). *Telephone Office*: 30964, 30965, *Works*: 60637, *Telegrams*: OJAS, Bombay.

Manufactures:—The Indian Enamel Works Ltd., are manufacturers of high grade Enamel Iron Signs and Hollow Wares.

Indian Engineers' Corporation Ltd.

Managing Director: Mr. P. S. Kalsey (A. M. I. B. E.) (London). *Secretary*: Mr. Wassan Singh, Nijjer. *Office & Works*: Outside Chatiwind Gate, Canal Bridge, Amritsar, P. O. Box No. 8. *Telegram*: INDENGICO, *Trade Marks*: Pinion & I. E. C.

Introduction:—Messrs. Indian Engineers' Corporation came to be established in 1943 for the manufacture of wood screws. Machinery from abroad being impossible due to war, they fabricated their own machinery for the manufacture of wood screws, nails and cotton pickering machines.

When the erection of the plant was completed in 1944, the works were divided into three departments which work under three different names.

1. *Indian Defence Workshop*: for producing special machine tools, such as wood screw making plants, rivet making machine, machine-screw making plants, panel pin-making machine and wire-nail making machines.

2. *Sweden Screw Factory*: to manufacture wood and machine screws, panel pins and rivets of all types.

3. *Cotton wadding and Surgical Factory*: for making cotton pickering machines only. The firm has recently been converted into a limited liability Co., with a capital of 5 lacs which they soon hope to raise to 25 lacs.

Present Condition:—At present they have got two efficient plants for producing wood screws at least 600 grosses daily and 4 cwt. rivets and a dozen panel-pin making machines, to produce 1,350 lbs. of Panel pins daily. They have been able to manufacture some of the latest, highly-developed machines which could not be imported during the war. Their machine tools are of high efficiency. After an inspection by the Machine Tool Controller, the firm has been placed as licensed machine tool manufacturer for the various machine tools which were never manufactured in India before the war.

Their quality products under "Pinion & IEC" brand have been used all over India and have a ready market so that they do not get a chance to store their finished products and machines.

Besides this the firm manufactures commutators, rotors, stators for table and ceiling fans.

The total strength of the labourers employed by the Corporation is between 75 and 100, half of whom are skilled.

Dearth of skilled labour and paucity of steel wire, particularly of good quality has greatly hampered their progress so much so that for some time the main portion of the plant stood idle.

Future Plans:—The management have plans to increase the production as far as possible with a view to decreasing the cost. They have arranged to install a complete plant for wire drawing at their works. Equipment for producing such hardware accessories as screw hooks, coach screws, hasps, hinges, etc., is also under consideration.

Apart from it new machine tools shall be added to their workshop so that efficient machinery may be fabricated in India such as:—

Cold Heading machines for big size Engineering Rivets of all size.

Non-ferrous metal-wire drawing machines.

Jewellers Rolling Mills.



Mr. W. S. Nijjer
Secretary
Indian Engineers Corporation Ltd.
Amritsar

Multiple die machine for drawing thinner size wire for electrical wiring.

Wire-nail making machines of all sizes.

Bolt nut making plants.

Other such precision type of machines.

Indian Expanded Metals Limited.

Managing Director: Mr. N. B. Bhagat. *Office*: 2nd floor, Prospect Chambers, Hornby Road, Fort, Bombay. *Works*: Sewri Fort Road, Bombay 15. *Telephone*: 60445, *Telegrams*: EXPEEYAM.

The company was incorporated in January 1941 and the whole output was taken up by the Government during the period of war.

The Company is now in a position to cater to the civil demands of the country. They are manufacturing Expanded metal of Mild Steel, Brass, Copper and Aluminium in various meshes to B. S. specification.

Indian Hume Pipe Co., Ltd.

Managing Agents: Messrs. Walchand & Co., Ltd. *Head Office*: Construction House, Ballard Estate, Fort, Bombay. *Factories*: All over India, Rangoon and Colombo. *Telephone*: 32894, *Telegrams*: HUMEPIPE, Bombay.

Introduction:—The Indian Hume Pipe Co., Ltd., were started in 1926 and are the chief, and till recently were the only company engaged in the production of Hume Pipes. By 1941 they came to own 35 factories in India, Rangoon and Colombo. The Company have put up an electric steel furnace and a rolling mill to produce their own wires and rods. They have also a well equipped workshop at Bombay and Jamshedpur for the manufacture of machinery. Their plan is to set up a Hume Pipe Factory in every province of India except N. W. F. & Assam. This is expected to mitigate the difficulties of transport and labour and may ultimately be of great benefit to the

consumer. Their engineers are frequently sent to foreign countries to study the latest improvements to be embodied in their manufacture.

Hume Steel Pipes:—Hume Steel Pipe is a pipe built of M. S. Sheets of required thickness the joints (both longitudinal and circumferential) of which are welded up by metallic arc process. Steel Shells so built up are then internally lined with spun concrete and protected on the outside with either Hessian bitumen, or vibrated re-inforced cement concrete, thus protecting the steel completely from corrosion. The pipes can be manufactured with spigot and socket ends as required, and in length upto 30′ according to the size of the steel plates.

Hume Steel Specials:—In addition to the plain pipes, various types of specials such as flanged pipes, Bends, T's, Scour tees, Elbows, flanged or socketed branches, flanged tail pieces for valves, tapers, fire plug branches etc., can also be supplied.

All flanges are forged and machined to the correct size and drilled as per B. S. S. for pipe flanges.

Old C. I. and Steel mains which have been in use and are corroded, can be re-conditioned and made as good as new by Hume process.

Conclusion:—Hume pipes combine in themselves the strength of the steel pipes and long life of the concrete pipe and therefore have been found to be very suitable for water supply and drainage projects.

Messrs. Indian Malleable Castings Ltd.

Managing Agents: Messrs. Ramdutt Ramkissendass. *Office*: 4, Clive Ghat Street, Calcutta. *Works*: 44, Mohesh Mukherjee Road, Belghoriah, 24 Parganas. *Telephone Office*: Calcutta—3594, *Works*: B.B.—5322, *Telegrams*: INMALCA.

Introduction:—This premier concern of manufacturers of malleable castings was incorporated in the year 1937. The production was started in the year 1938. It was at once

realised that raw materials and working conditions in India were entirely different to those in England or America, and that Indian Pig Iron particularly was not suitable for the manufacture of malleable castings by the process in vogue in Europe and America. Nevertheless, through the assiduity and undaunted efforts of the management and chiefly as a result of intensive research work conducted and carried out at the company's laboratory, it was possible to manufacture, for the first time in India, from indigenous raw materials, high grade malleable casting according to British Standard Specification. On the outbreak of war, the company's productive capacity, which had hitherto been almost entirely confined to Railway demands, was mobilized to the maximum degree to meet the requirements of the armed forces. Additional plants were installed and production was raised to the highest limit. Enormous quantities of war materials including parts for Rifles, Machine guns, Tanks, Aircrafts, Vehicles, Bridges etc. as also materials for the Red Cross, the Army Out-fit etc. were manufactured for the different theatres of war.

After the termination of the war the management was transferred to Messrs. Ramdutt Ramkissendass with Mr. K. P. Goenka as the Chairman of the Board of Directors.

The products manufactured by the company are of a varied nature and cover the requirements of a wide range of customers, including Railways, Mechanical, Civil and Electrical Engineers, Jute and Cotton Mills, Pipe merchants, Cement factories, Potteries, Sugar mills and other major industries. A few of the important products manufactured on a large scale by the company are given in the following list.

1. *Railway Materials.*

   Universal Coupling, Dummy Coupling, Ball Coupling, Release Valve Body and Cover, Release Valve Spindle and other Vacuum Brake fittings, Buffer Washer, Spring and Dividing Plates, Top and Bottom Seats, Horncheck, Escapement Crank, Driving Bar Lug, Swan Neck, Bearing Plate, Oil Box, Signal Lever, Eccentric Strap and a wide variety of fittings for Loco, Carriage, Wagon and Signalling.

2. *Mechanical Engineering Goods.*

Gear and Pinion, Lever, Chain Link, Elevator Bucket, Bridgepiece, Washer, Crank, Pulley, Wheel, Bracket, Clamp, Pawl, Hinge, Vice, Lathe-parts and a wide variety of other machine parts.

3. *Electrical Engineering Goods.*

Fan hanger, Terminal Socket, Fan Shank, and other Fan parts, Shackle, Cap, Clevis and other insulator parts, Bracket, Back, Boss for Turbine and Fan Rotor, Wire Trainer etc., etc.

4. *Jute and Cotton mill parts.*

Loomsword, Beam Plange, Roving Steadier, Box Front, Dog Casting, Thread Guide, Shuttle Tip, Pressure Bar, Bobbin Lifter, Dobby parts, Hitter, Picker, Picking Shaft, Duck Bill etc., etc.

5. *Pipe Fittings.*

Socket, Tee, Union, Bend, Elbow, Lock Nut etc. of all sizes and types.

6. *Miscellaneous Industries Goods.*

Chilled Roll, Guide, Balls etc. Quoill for Printing machine, Mould for Rubber Works and Glass factories etc., Cycle parts, Gas Cylinder Cap, Filbow, Knob casting, Protecting Dome, Shoe machinery parts, Step Iron for P. W. D. Hook Cleat, Earth Auger, Eye Bracket, Gun parts etc.

Future Outlook :—Due to the war the company did not have a chance of importing suitable machinery from abroad to augment proportionately its growing activities. Hence it has not been able to put up a machine shop and to undertake the manufacture of finished jobs up to the present time. The bulk of its products is supplied un-machined. The company is arranging to erect a fully equipped machine shop with machinery imported from the U. K. When these are obtained and installed, the company will be in a position to undertake the manufacture of finished articles for Textile and other industries, as also complete assembly of Railway fittings.

The company is negotiating with Foundry Mechanizing Experts for installation of an up-to-date Sand reconditioning and handling, moulding, coreblowing, fitting and surface treatment plants on mass production basis.

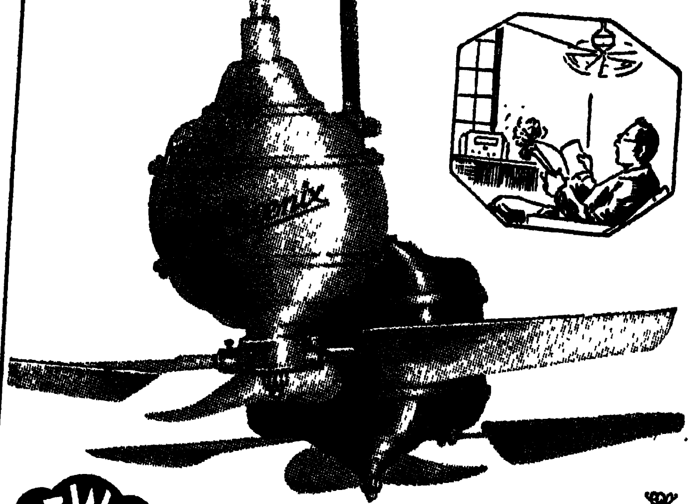
Indian Mica Supply Co., Ltd.

Managing Director: Seth Chandmal Rajgharia. *Head Office*: 98, Lower Chitpore Road, Calcutta. *Works*: Giridih (E. I. R.), *Telephone*: *Head Office*: B.B. 992, *Telegrams*: INSUP.

Activities:—The Indian Mica Supply Co., Ltd., carry on their activities as mica miners. In addition they have an engineering workshop where they manufacture their own special machines and tools for certain processes of mica manufacture.

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THE ENGINEERING WORKS OF INDIA LTD

(A BEHARILAL RAMCHARAN CONCERN)

HEAD OFFICE: 46, CHITTARANJAN AVENUE, CALCUTTA. PHONE B.B. 5632. GRAM: ENGWORKCAL

The Indian Smelting & Refining Co., Ltd.

Managing Director: Mr. Francis Klein. *Office*: Shale Building, Bank Street, Bombay. *Works*: 101, Sion Road, Sion, Bombay. *Telephone*: 32831, *Telegrams*: ISRAC.

Introduction:—The Indian Smelting & Refining Co., Ltd., was started in the year 1930 with six furnaces and an up-to-date metallurgical laboratory under the supervision of a European expert metallurgist. It was floated as a private limited company and has since then grown satisfactorily.

Manufactures:—The Indian Smelting & Refining Co., Ltd., are producing metals and metal alloys of non-ferrous nature. They have introduced rejuvenating and reconditioning of non-ferrous metals in Indian State Railways and Private Railways. In this respect they have been the pioneers. Before the inception of their works the Rejuvenating and Reconditioning of non-ferrous metals and metal alloys was quite unknown in the Indian State Railways and Private Railways. Now after about 10 years reconditioning of metals has become a daily routine and is executed by many works which appeared later on the scene. Their lines of manufacture include the following:—

Gun Metal, Bronze Phosphor Bronze, Sculptors Bronze, Bell Metal, Yellow Metal (Brass), White Metal (Antifriction), Die Casting Alloys, Type Metal, Mono Type Metal, Lino Type Metal, Stereo Type Metal, Solder of any specification, Metal alloys ot any specification, Copper, Lead, Antimony, Tin, Nickel, Aluminium, etc.

Present Position:—Their capacity of production at present is about 4000 tons per year of metal alloys. The number of labourers is 150. The Works have been shifted in 1937 to Sion, a suburb of Bombay where a factory on most modern lines has been erected. In the field of metallurgical engineering smelting and refining, the factory is one of the biggest of its kind in the country.

The Indian Standard Metal Co., Ltd.

Secretaries & Treasurers: The Investment Corporation of India Ltd., Ewart House, Bruce St., Fort, Bombay. *Office & Works*: Chinchpokli, Cross Lane, Bombay 27. *Telephone*: 43014, *Telegrams*: "ISMETCO", Bombay.

Introduction:—The Company was founded in 1936 by Mr. Anton Schwarz, M.I.M. (London) as a private partnership firm and was converted into a private limited company in 1939 with an authorized capital of five lacs of rupees. At the beginning of the War the Company, who had their Works at Mazgaon, acquired new premises in the Mill Area at Chinchpokli Cross Lane, Byculla. The new Works cover an area of 38,000 sq. ft. In 1943 Messrs. Tata Sons Ltd. acquired through The Investment Corporation of India Ltd. a controlling interest in the firm. The authorized capital was raised to fifty lacs of rupees of which ten lacs are paid up at present.

Mr. A. Schwarz, the pioneer of the non-ferrous smelting and refining industry in India, who likewise was responsible for starting other similar enterprises in this country, is still the Technical Director of the Company as a member of the Board of Directors.

During the last War the Company executed large Government orders for manufacturing munition components. The I. S. M. Works were declared a Government Notified Factory. Till the end of 1945 they employed 900 workers. This number has, however, been reduced to 550 in 1946.

Lines of Manufacture:—The Company has up-to-date Smelting and Refining Works, with a smelting capacity of 14,000 tons per annum, engaged in the manufacture of Copper, Gun Metal, Phosphor Bronze, Brass, Aluminium, White Metal, Solders, Type Metal, Monel Metal, Acid and Alkali Resisting Alloys, Fusible Alloys and other Non-ferrous Alloys. They are also producing Zinc Oxide used for various purposes including manufacture of anti-corrosive paints. Apart from this, the firm operates the largest Non-Ferrous Foundry in India, manufacturing rough and ready-machined sand, centrifugal, chill and die-castings. An up-to-date Machine Shop, equipped with the

latest type of machine-tools, is attached to the Foundry. The Company manufactures and has marketed with outstanding success for the last ten years a high tin-base Bearing Metal, branded as "AD" Bearing Metal (Registered Trade Mark), which to-day is one of the standard requirements of Engineering India. Many letters of appreciation on the outstanding qualities of their "AD" Bearing Metal have been obtained and clients have pointed out in several instances that "AD" Bearing Metal has been proved superior to imported bearing Metal.

The Laboratory and Testing Department of the Company have undertaken material testing and analysing on runnning contracts for Government Departments and are at present engaged in important metallurgical research on behalf of Government. The Company's management, anxious to maintain the firm's reputation as the leading manufacturers in India, has an ambitious postwar expansion scheme including the extension of the present refining and smelting capacity to 20,000 tons per annum. The future manufacturing programme will also include electrolytic copper, copper and brass sheets and extruded sections.

The Indian Steel & Wire Products Ltd.

Managing Agents: Messrs. Indra Singh & Sons, Ltd. *Office & Sales Office*: Wellesly House, 7, Wellesly Place, Calcutta. *Head Office & Works*: Tatanagar, (B. N. R.) *Telephone*: *Cal.—Office*: Calcutta 4317, *Head Office & Works*: Jamshedpur 18, *Telegrams*: WIREFORMS.

Introduction:—The Indian Steel and Wire Products Ltd. came into being just after the world War I but it did not thrive and came under liquidation when it was purchased by Sardar Indra Singh (now Sardar Bahadur Sir) in 1926.

Development:—The total capacity of the mills at the time of purchase was less than 1,500 tons of wire and wire products annually. Additional equipment increased the capacity to 2,000 tons per year. In the mean time protection was also granted by the Government in 1931 which was extended for seven years in 1934. During this period Sardar

Bahadur Sardar Indra Singh erected his own Rod Mill for making wire rods which were till then imported from abroad. The capacity of the plant was raised to 45,000 tons of rods per year which resulted in increased output of other subsidiary products of wire and wire nails also.

In 1935 the concern was converted into a Limited Liability Company.

Pre-war Position :—Till the outbreak of the war the Company was engaged in manufacturing the following items:—

Rods below ½" diameter, Hard Bright Wire, Annealed Wire, Galvanised Wire, Wire Nails, Barbed Wire, Bolts, Nuts and Rivets.

War-time Development :—During the war they successfully started the manufacture of Telegraph wires and Barbed wires which were considered to be beyond the scope of Indian Factories. For this purpose they had to extend their plant by twenty four additional machines.

Manufactures :—At present the items of their manufacture include:

Rods and Squares.

Wires—Hard bright and annealed wire, Galvanised Wire, Telegraph Wire, Barbed Wire, Spring Steel Wire, Metal Spraying Wire, Signal Wire, Electrode Wire, Standard Wire, Stitching Wire, Needles and Pin Wire, Tyre Wire.

Hinge Pins, Staples, Wire Nails, Panel pins, Bolts and Nuts, Rods.

Conclusion :—In the matter of quality, the products of the Indian Steel & Wire Products Ltd., claim parity with the imported materials. Now that the war is over the Company is in a position to cater for the civil demands of the country.

The Indian Tool Manufacturers Ltd.

Managing Director: Mr. S. G. Nevatia. *Office*: 250, Worli, Bombay 18. *Works*: 101, Sion Road, Sion, Bombay. *Telephone*: 42091, *Telegrams*: ITOOLS.

Introduction:—The Indian Tool Manufacturers Ltd. were started in 1937 by Mr. G. I. Bondy, in co-operation with Messrs. Francis Klein & Co. Mr. Bondy had brought with him from Europe all the machinery for the manufacture of small tools such as twist drills, reamers, and cutters, etc. The factory was put up in July, 1936, and has been running under his own supervision.

In June, 1943, all the shares of the Company were purchased by the present management with Mr. S. G. Nevatia, as Managing Director. Important additions and alterations were then carried out to increase production.

Manufactures:—This is one of the few factories in India specialising in the manufacture of small tools. Best quality steel, most suitable for manufacturing tools of different kinds is used.

Present Position:—At present the factory is capable of producing about 70,000 tools per month. By adding some more machines for which arrangements have already been made, this will reach about one lakh of tools per month.

Future Outlook:—During the war the factory was under control and worked only for the Government. Now that the control has been lifted the factory is working for all customers. Their manufactures at present include the following:—

Drills in fractional and decimal inch sizes and in millimetre sizes.

Straight and Morse Taper Shank Drills ranging from 3/64″ to 3″ dia., in standard and special lengths.

Square Taper Shank Drills ranging from 1/4″ to 2″ dia.

Three and Four Groove Drills.

Parallel Shank Drills with 1/2″ and 5/8″ Shank ranging from 1/8″ to 1--/2″ dia.

Combination Centre Drills.

Special Drills according to requirements.

Reamers

Hand and Machine Reamers with straight or spiral flute ranging from 1/8″ to 2″ dia.

Bridge Reamers.

Taper Pin Reamers.

Chucking Reamers.

Reamers for Morse Taper Holes.

Taper Reamers for Locomotive Work.

Special Reamers according to requirements.

Milling Cutters upto 5″ Dia.

Slotting Cutters.

Plain Milling Cutters.

Side and Face Cutters.

Single, Double and Equal Angle Cutters.

Relief Cutters, as for grooving taps, for fluting reamers, etc.

End Mills.

T Slot Cutters.

Woodruff Cutters.

Shell End Mills.

Special Cutters according to requirements.

Taps

Special Taps for various purposes.

The Investa Machine Tools & Engineering Co., Ltd.

Managing Agents: Messrs. Investa Industrial Corporation Ltd. *Office*: Ewart House, Bruce Street, Fort, Bombay. *Works & General Office*: Clerk Road, Pais Street, Bombay 11. *Telephones*: 42004, 42005, *Telegrams*: VESTATOOLS.

Introduction:—The Company was incorporated in the year 1942 and was formed with the primary object of manufacturing first-class machine tools of various types. Due to the difficulty of securing machine tools, the old established firm of Messrs. Vithaldas Purshottam & Sons was purchased *en block* and further a number of machines were purchased elsewhere and installed in the factory. The premises were enlarged and altered and the factory now comprises a compact, well equipped, workshop with foundry, drawing office etc. Their work is entirely self-contained and the machine tools manufactured in the factory are designed and produced from beginning to end under one roof.

Items of Manufactures:—Their items of manufacture include machine tools such as Shearing and Punching Machines, Guillotine and Shearing Machines, Mortar Mills and Lathes. The production of Investa Lathe which the Government of India have classed as the first grade is steadily progressing. In addition to these, small machines such as Polishing Machines, Rotary Core Making Machines, Brick Making Machines are also manufactured.

The company employs about 360 workers, skilled and semi-skilled and is a first-class machine tool manufacturer in the country. Under the management of Tatas, the Company is expected to make further progress in the manufacture of machine tools in the country in the very near future. Although started recently, the Company has already produced a number of machine tools of the first grade quality and has made a good contribution to the war effort.

Galvanised Stranded Wire

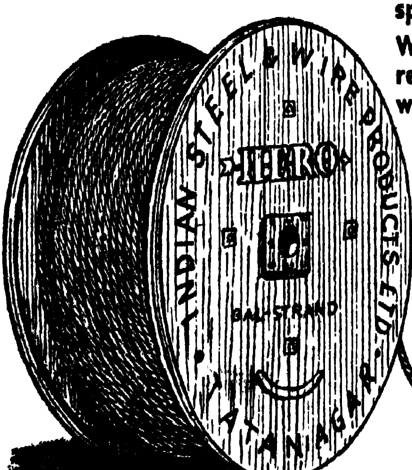
IS NOW MADE IN INDIA

HERO

At our works in Tatanagar, HERO brand galvanized stranded wires are manufactured in sizes ranging in diameter from 3/8" to 3/16", 7 ply and supplied in battened wooden spools of 10 cwts. each, 4000 to 15000 ft., in continuous lengths according to size.

Supplies can also be made to tensile strengths of 40 to 90 tons per square inch and to different specifications.

Write to us describing your requirements and correct advice will be given free of obligation.



Other HERO brand Products: Pin and Clip wires; Signal, Spring and Stitching wires; Electrode wires etc.

THE
INDIAN STEEL & WIRE PRODUCTS LTD
TATANAGAR

The Jaipur Metal Industries Ltd.

Head Office: Kamani Chambers, Nicol Road, Ballard Estate, Bombay. *Works*: Jaipur (Rajputana). *Telephone*: 172 and 201, *Telegrams*: METALS.

Introduction:—This is one of the most important Units in the Kamani Group of Industries for the manufacture of Non-ferrous Metals and Alloys. It is the biggest industrial Unit in Jaipur State and the largest of its kind in the country. Originally established as a private concern in 1942, it was converted into a public limited company with an authorised capital of Rs. 50,00,000 and issued and paid up capital of Rs. 20,00,000 in 1943.

Plant & Equipment:—The works comprise a Refinery, a Rolling Mill and Wire Drawing Plant.

Activities:—To the Refinery are also attached the Moulding and Finishing Departments. In this section the work of refining, reconditioning, alloying and chill-casting of practically all non-ferrous metals is undertaken.

In the Rolling Mill Department, rolling of rounds, squares and hexagons from ¼″ to 1¾″ and drawing of all the sections upto 3″ are undertaken. These sections are supplied in soft, semi-hard, hard and bright polished conditions.

The Wire Drawing Plant draws all kinds of wires of non-ferrous metals and alloys upto 40 gauge. They have also arrangements for insulating Copper wires either with cotton (D. C. C.) or silk (D. S. C.)

Specialities:—The manufacture of arsenical copper and their rods from ordinary copper for use in Boilers of Railway locomotives and to the required specification is one of the outstanding speciality of the factory. They are manufacturing all non-ferrous alloys to various specifications such as B. S. S., I. R. S., I. M. S., etc. They have successfully done some of the most difficult castings in gun-metal and phosphor bronze, both solid and cored. Similarly, they have succeeded in rolling manganese bronze, phosphor bronze, etc. requiring a very high degree of tensile strength. All these products satisfy chemical tests as well as all the physical tests such as tensile strength,

elongation and yield point tests as laid down in the various standard specifications. They have also succeeded in making master alloys for making phosphor copper, arsenical copper, silicon brass, etc. and all kinds of bearing metals required by the Railways. Their materials have been tested in different Government Laboratories and found fully satisfactory, both in tests and in actual service.

Laboratory:—The Unit also maintains a good Chemical Laboratory with facilities for routine analysis and research work for the improvement of manufacturing technique and the development of new processes. A universal testing machine and a metal microscope are to be set up shortly.

J. K. Iron & Steel Co., Ltd.

Managing Agents: Messrs. J. K. Ltd. *Office*: Kamla Tower, Cawnpore. *Works*: Kalpi Road, Cawnpore. *Telephone*: *Head Office*: 33, 34 and 36, *Works*: 2887, *Telegrams*: STEEL, Cawnpore.

Introduction:—This company was established in the year 1935. The plant which was ordered from abroad and came in 1938-39 consists of:

(1) Electric Steel Furnace, (2) Rolling Mills especially adapted for making hoops and strips of small sizes. All sections from 1″ down to 3/16″ of rounds, squares, flats, angles, etc. can be manufactured in this mill.

Manufactures:—The Company has specialised in manufacturing hoops only for cotton and jute baling purposes for which they were till recently the only concern in the country.

Their present output of hoop is estimated at 700 tons per year with capacity for 17,000 tons.

The Company employs about 3,000 labourers on an average and has introduced various welfare measures for their benefit.

Their sales have been canalised through Messrs. Mac. Gregor Balfour Ltd., Calcutta.

Jagjit Engineering Works.

Proprietor: Mr. K. L. Sakhuja. *Office & Works*: Kapurthala. *Telephone*: 25, *Telegrams*: JAGWORKS.

This private firm was established in 1944 with a capital of Rs. 1,30,000. It is engaged in the manufacture of wood screws, machine screws, rivets and blue tacks and has about 190 workers working in the factory.

Jas. Alexander & Co., Ltd.

Regtd. Office & Works: 15, Watgunge Street, Kidderpore, Calcutta. *Principal Office*: 8, Dalhousie Square East, Calcutta. *Telephone*: *Works*: South 1401, *Prin. Office*: Cal. 3016, *Telegram*: JASALEX.

Introduction:—The firm was started in 1916 during the first great war and in the beginning worked mostly for the Munitions Department of the Government supplying timber poles for bullock traction, axle trees for mule carts and picket posts for bared wire entanglements etc., etc.

Activities:—When they changed over to civil requirement they started working for tea gardens, jute mills, collieries and sugar mills etc. Orders for leaf houses, withering sheds, coolie huts and fencing materials were secured from the tea-garden concerns and for pit-head frames, pit cages, coal tubs and winding pulleys etc., from the collieries. They also manufactured Sugar Mill Machinery such as crystallizers, sulphitation tanks, conveyors, sugar dryers and self supporting chimneys etc. For the Jute Mills transmission gears such as W. I. and C. I. pulleys and drums, shaftings, bearings, hangers, brackets etc. were manufactured.

In 1922 the Company was changed into a Limited Liability Company and removed to its present larger and more convenient site at 15, Watgunge Street, Kidderpore.

Recent Development:—In 1932 they made an agreement with the Air Conditioning Corporation Ltd., and started the manufacture of air-conditioning plants also. The manufacture

of humidifier machines, galvanized trunking regulating dampers, circulating fans and all the accessories in connection with the installation of air-conditioning plants was undertaken from the latest designs and according to the latest practice.

They introduced the use of electric arc-welding. Their petrol and oil tanks are in use in various oil depots throughout the country.

The Second World War-1939 :—During the war their resources were mobilised and put at the disposal of the Government.

In 1941 the Company passed into the hands of Messrs. Sooraj Mull Nagarmul who have ordered for various new machinery worth lacs of rupees to make the workshop one of the biggest and most up-to-date in India.

During this period they manufactured such varied items as transit and storage sheds, portable jib cranes, overhead cranes, bitumen boilers, wire and rope blocks, luggage carts, wheels and axles, petrol tanks, lorry scotches, chimneys, cupolas, lens grinding machines, lifting jacks, hot water cisterns and a host of other things inspite of the difficulties of shortage of machine tools, tool-steel hand tools and also man-power. Arrangements have been made for the fabrication of patent tea sorting machines, tea roasting machines, metal tea storage bins and water filtering appliances etc. locally.

———

Messrs. Jamnadas Brothers, Calcutta.

Proprietors: Mr. J. B. Ved, Mr. K. B. Ved, *Office*: 69/4, Canning Street, Calcutta, Present address 195/1 Harrison Road, Calcutta. *Works*: The Pratap Aluminium Works, 139, Benares Road, Salkia, 13, Watkins Lane, Howrah. *Telephone*: Howrah 403, *Telegrams*: POORADAM.

Introduction:—This firm was first run in the name of Messrs. Gordhandas Maneklal but six years ago it was purchased by the late Prop. Seth Bhanji Morarji Ved. Since then the factory has been steadily progressing. The workshop, situated at 13, Watkins Lane was purchased by the present proprietors in 1944. In spite of very critical times in the past as well as in the present the progress of the firm has been steadily maintained.

Products:—The works manufacture household utensils of all varieties of Aluminium, Brass and Copper.

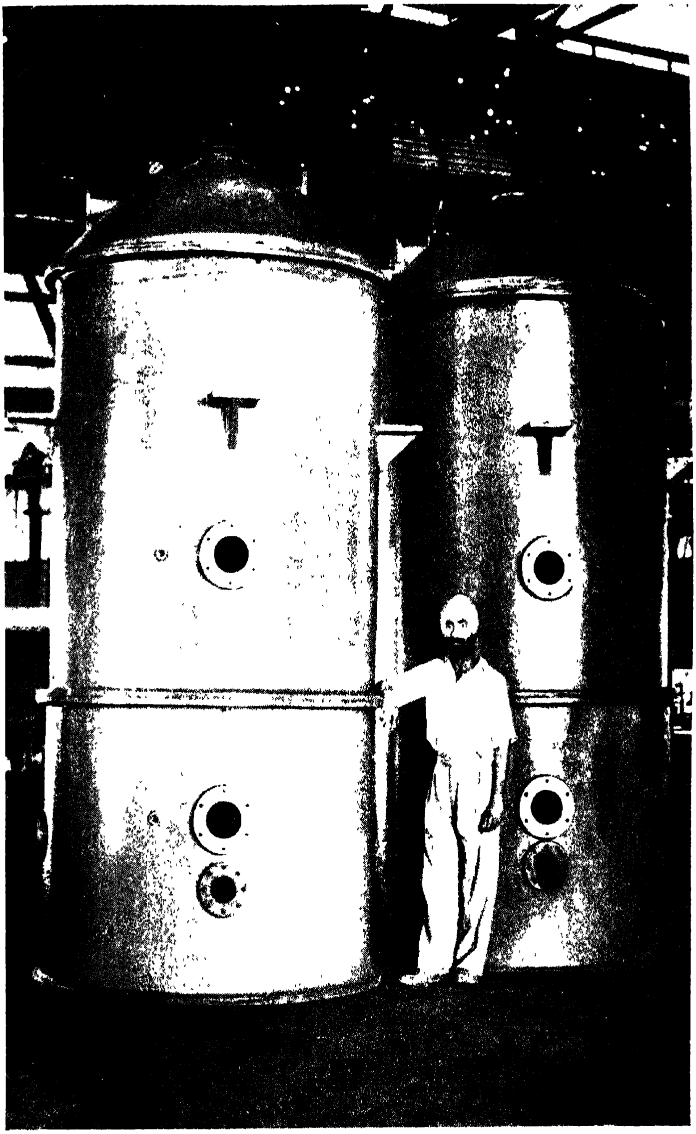
The Jamshedpur Engineering & Machine Mfg. Co., Ltd.

Managing Agents: Messrs. Indra Singh & Sons Ltd. *Office & Works*: Tatanagar (B. N. Rly.) *Telephone*: Jamshedpur 276, *Telegrams*: JEMCO, Tatanagar.

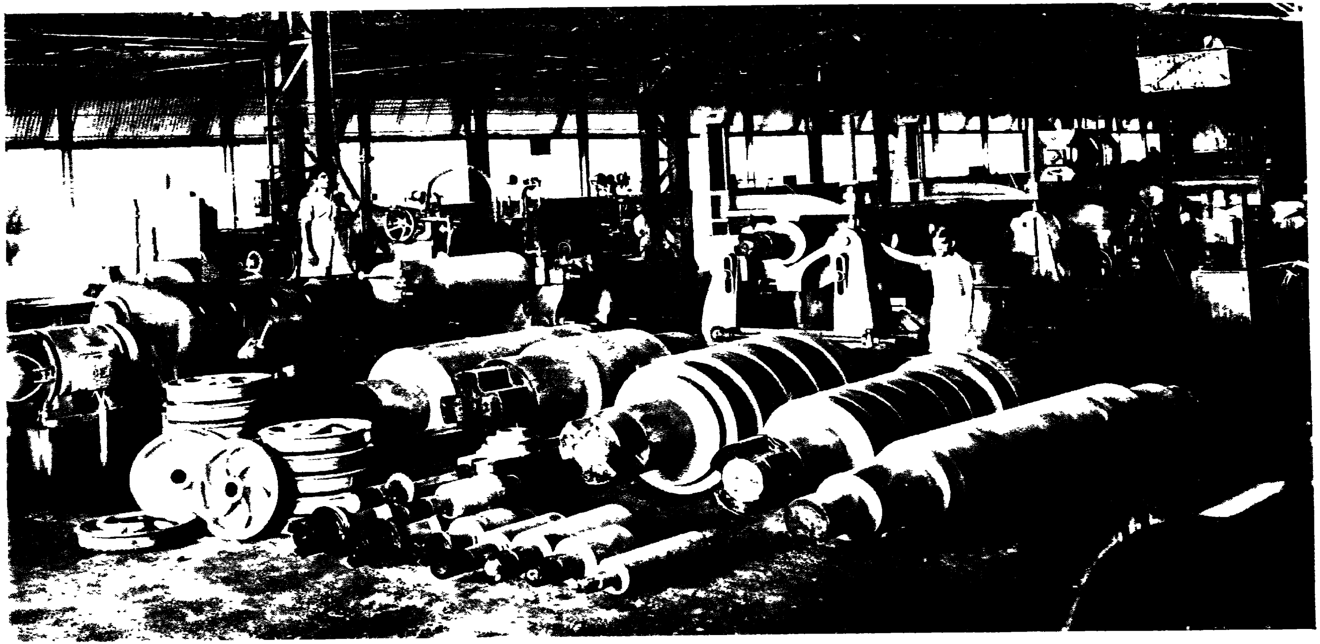
Introduction:—Established in 1921 it was a European managed firm manufacturing textile machinery. In 1923 it was re-constituted as a general engineering works which, however, came to grief in 1926. In 1934 it was purchased by Seth Jeewanlal Motichand who in 1936 for certain considerations transferred his interests in the concern to Messrs. Indra Singh & Sons Ltd.

It has now a fully equipped machine shop, a pattern shop, a general foundry, a roll foundry, a roll turning shop and a chemical laboratory.

Manufactures:—At present the concern is engaged in the manufacture of different qualities of rolls such as Plain Chill



Anti Corrosive Castings
(Sulphitation Tank for Sugar Mills)
Jamshedpur Engineering & Machine Manufacturing Co., Ltd.



Some Specialised Chilled Castings

Chilled Rolls—both St. Carbon and Alloyed Rolls—Rolls for the steel and Non-ferrous Rolling Mills of India—Weight ranging from a few lbs. to more than 20 tons each.
Also some chilled wheels for the Indian State Railways.

Jamshedpur Engineering & Machine Manufacturing Co., Ltd.

Rolls, Sand Cast Grain Rolls, Nickel-chrome Chilled Rolls, Super-hard chilled rolls, Heavy Duty rolls, Semi-Steel rolls (Nickel-Chrome-Vanadium Semi-Steel products), Mina-S rolls, Adamite Rolls, Phoenix rolls etc.

The concern manufactures chilled cast iron wheels according to the latest British and American specifications. Such wheesls are used in locomotive tenders and in goods wagons.

Special Duty castings e.g., anticorrosive and heat resistant castings and other specialised lines of manufacture which are required for the chemical industry are also undertaken. The manufacture of iron having high tensile and good fatigue properties which are specially required for machine parts subject to intense fluctuating stresses, is also undertaken by the firm.

Their list of consumers includes such important concerns as (1) The Tata Iron & Steel Co., Ltd., (2) The Steel Corporation of Bengal Ltd., (3) The Tinplate Co., of India Ltd., (4) Mukund Iron & Steel Works, Bombay & Lahore (5) W. Leslie & Co., Ltd., Calcutta (6) Bata Shoe Co., Ltd., Batanagar (7) J. K. Iron & Steel Co., Ltd., Cawnpore (8) The Metal & Steel Factory, Ichapur (9) Eagle Rolling Mills, Kumardhubi (10) Guest, Keen, Williams Ltd., Calcutta (11) The National Iron & Steel Co., Ltd., Belur (12) The Indian Steel & Wire Products Ltd., Indranagar, *Via.* Tatanagar (13) The Steel & General Mills, Lahore (14) The Steel Re-Rolling Mills, Negapatam and others—in fact all the rolling mills of India.

Conclusion :—Since the elimination of Japan from the field this firm is the only one manufacturing chilled rolls and chilled wheels in the whole of Asia including Siberia.

Very good progress has been registered by the Jamshedpur Engineering and Machine Mfg. Co., Ltd., in the manufacture of rolls in India. Considering its importance to the entire metallurgical industry and the headway it has made towards self-sufficiency it can be said without prejudice that the industry has a fine future ahead.

Jay Engineering Works Ltd.

Managing Agents: Messrs. Madanmohanlal Shri Ram & Co., Ltd., Delhi. *Office & Works*: 183-A, Prince Anwarshah Road, P. O. Dhakuria, 24 Parganas. *Telephone*: South 2020, *Telegrams*: USHAKO, Calcutta.

Introduction:—The Company was started in 1935 with an initial capital of 250,000 as a private limited company but was subsequently converted into a Public Limited Company in 1938 and its capital was raised to Rs. 15,00,000.

Manufactures:—It had been started with the object of manufacturing Sewing Machines on a large scale but the exigencies of the war obliged them to take up several Government contracts under which they manufactured various engineering stores, Telephone sets, Air-craft and Armoured Vehicle Components, and many other Munitions items for the different theatres of the war.

They have taken up certain other items also and are manufacturing Railway Signalling Instruments, Cooking Ranges, Fans, Water-meter, Hurricane Lanterns and Meehanite Castings also. They also acquired rights to exploit a patent of the Board of Scientific and Industrial Research of the Government of India and started a separate section for the manufacture of Paints, which has to-day developed into a full-fledged Paint Factory.

They have now installed an imported complete plant for the manufacture of Sewing Machines. The firm has developed into a huge, well-equipped modern workshop, giving employment to about 1,500 people with a monthly production capacity for 2,500 sewing machines, 500 Electric Fans, 20,000 Hurricane Lanterns, Cooking Ranges, Meehanite Castings and Industrial Paints like Stoving Enamels for wood and metals, Insulating Varnishes, Gopal Varnish etc. etc. Jobbing work in the nature of casting, Forging and Machining is also conducted on a large scale.

The firm has both physical and chemical laboratories with facility for routine analysis and research work for the improvement of manufacturing technique and development of new processes.

Besides these, they also undertake orders for castings, forging and machining for miscellaneous articles.

Future Outlook:—The firm, with its able management its resources and present line of manufacture has a great future.

Messrs. Jayant Metal Manufacturing Company.

Proprietor: Mr. C. D. Parikh. *Works & Head Office*: 152, Lohar Street, Bombay, *Branch*: 17, Tarachand Dutt Street, Calcutta. *Telephone*: *Office*: 23919, *Cal. Office*: B.B. 6449, *Works*: 42321, *Telegrams*: JAYANTBABU.

Introduction:—Jayant Metal Manufacturing Company was founded by Mr. Chimanlal Dayabhai Parikh in partnership with Mr. Jayantilal S. Padshah in 1935. They started with a small foundry to cast brass, copper and bronze metal building fixtures of modern designs. Now they have a big factory with a good mechanical workshop, electro-plating plant and skilled workers operating modern equipment.

Manufactures:—Before the outbreak of the war their manufacture was confined to articles of building hardware only. Since 1939 they have started the manufacture of non-ferrous rods and wires also. The entire process of billet-casting, rolling and drawing are done at the factory. Their present capacity is about 65,000 lbs. per month of wire and 30,000 of rods. They manufacture their wires and rods to different IRS and BSS and other Government specifications and possess necessary equipment to draw wires from 14 S. W. G. to 20 S. W. G. They have the wire drawing blocks to draw wires from 14 S. W. G. to 20 S. W. G. They manufacture and supply various specification materials to Government, the chief being silicon, welding rods, wires, naval brass rods (BSS 251), brass to I. R. S. N-1-36 and B. S. S. 249, nuts and bolts. They have started manufacturing hexagon and square sections also; Hexagons ranging from 1·1/2″ flat, brass square sections up to a maximum of one inch square, square copper wire for the manufacture of boat nails; brass and copper strips and flats varying from 2·1/2″ × 1/2″ to 3/8″ × 1/4″. Nickel silver wire and phosphor bronze sheets are also now manufactured by them.

Recent Development:—In the year, 1943, a semi automatic machinery for the manufacture of wood screws with capacity of 400 gross per month was installed, the largest size of screws manufactured being 4″ × 20 S. W. G. They have also extended their equipment for maintenance work and for the manufacture of dies. They also manufacture arsenical copper rods which are needed by Railways. They have installed one tilting furnace of 400 lbs. capacity and an automatic wood-screw machinery with a capacity of 2,000 gross of wood-screws per month. They have also succeeded in the manufacture of lead and silver wire.

Messrs. Jeewanlal (1929) Ltd.

Managing Agents: Messrs. Jeewanlal (1929) Ltd. *Office*: 101, Clive Street, Calcutta. *Factory*: Calcutta, Bombay, Madras and Rangoon. *Telephone*: Cal. 3323, *Telegrams*: (1) CROWNALUCO Calcutta, (2) All Branches MARTALUMIN.

Messrs. Jeewanlal (1929) Ltd. came into being as a result of amalgamation of Jeewanlal & Co. with a Canadian Company. Jeewanlal & Co. had come into existence in 1918 and had their branches in many centres including even places outside India like Rangoon and Aden. The price of Aluminium fell after the world war No. 1 and Aluminium Manufacturers in other countries made a bid for the Indian market. One of these was a Canadian Company and Jeewanlals were merged with this Company in 1929. Thus came into being Jeewanlal (1929) Ltd.

They are one of the top rank manufacturers in the industry and have extensive trade connections with several neighbouring countries. Messrs. Jeewanlal (1929) Ltd. have expanded their business considerably during the last war. Their organisation for collecting scrap is wide spread and their collections are large.

Their manufactures include all sorts of brass, copper and aluminium wares.



BINANI
for
B M W
METALS & ALLOYS
NONFERROUS
The BINANI METAL WORKS Limited
38. STRAND ROAD. Calcutta.
PHONE: Bz. 5383 . GRAM: NONFERROUS

Messrs. Jyoti Ltd., Baroda.

Managing Director: Mr. Ramanbhai B. Amin. *Office & Works*: P. O. Alembic Works, Baroda. *Telephone*: 287, *Telegrams*: JYOT.

Introduction:—Messrs. Jyoti Ltd., Baroda came into being as a separate entity in 1943 although a workshop had been in existence ever since 1936 doing repair works for the engineering department of the Alembic Chemical Works Ltd.

For the time being their attention was concentrated on the manufacture of chemical plants, small chemical machines, and domestic power pumps, under their trade mark 'Jyoti'. They also manufactured large size aether, caffeine and pilot vegetable ghee plants mostly for their sister concern Alembic.

Subsequent Developments:—By and by they began manufacturing all types and sizes of pumps to meet the increasing demand of agriculture, water works, sewage stations, industries and domestic requirements. Soon they took in hand a scheme for the manufacture of printing machines of all types and to begin with they brought out their 'Jyoti' Paper cutting machines. Soon they shifted their works to a new and more spacious site where additional equipment was installed and the capacity of their foundry was increased ten times. A Testing Laboratory was also started to conduct metallurgical and chemical tests of Castings and Saws etc. and research work.

Present Position:—The present capacity of their production can be roughly put at about 40 tons of cast iron castings and 2 tons of non-ferrous castings per month.

Messrs. Jyoti Ltd., employ on an average 300 skilled and 100 unskilled workers in their well equipped foundry, machine, welding, fitting, and testing shops. They have about 24 qualified supervising engineers in different shops. Their Managing Director and Manager and Engineer both had their training in mechanical and electrical engineering respectively in Germany and America.

Manufactures:—The main lines of their manufacture at present are:—Borehole Turbine Pumps, Sewage Pumps,

Centrifugal Pumps, Domestic Power Pumps, Force Pumps, Paper Cutting Machines, Chemical Plants, Vegetable ghee plants, Welded steel vessels, Filter Presses, Moulding Machines, Air Blowers, Oil Burners, Cast Iron Specials, etc.

Future Schemes:—In order to expand their business Messrs. Jyoti Ltd., with the help of their present Manager and Engineer Mr. N. B. Amin who has had thorough theoretical and practical training for a number of years in electrical engineering in America have planned new schemes and efforts are being made to execute them. Amongst the new development the immediate scheme is for the manufacture of electric motors.

Kamani Metals & Alloys Ltd.

Managing Director: Mr. Raj Ratna Ramji Hansraj Kamani. *Office*: Kamani Chambers, Nicol Road, Ballard Estate, Bombay. *Works*: Agra Road, Kurla (Bombay). *Telephone*: 87156, *Telegrams*: ALLOYS.

Introduction:—Besides Jaipur Metal Industries an account of which has appeared earlier and Kamani Engineering Corporation which is described below, this is another important unit in the famous Kamani Group of Industries. It has an authorised capital of Rs. 100,00,000 (One Crore) and subscribed and paid up capital of Rs. 40,00,000.

Equipment & Activities:—The Sheet Rolling Mill in this factory is the largest in Western India and it can roll sheets from billets of copper, brass, lead, aluminium, phosphor bronze, etc. upto 36 gauge correct to one thousandth of an inch. It can also make strips and foils upto 40 gauge. The factory is equipped for refining and reconditioning of non-ferrous scrap and making non-ferrous alloys to various standard specifications in bearing metals etc. As a part of its development scheme, arrangements are being made for importing an up-to-date automatic Sheet Mill plant which will nearly double the existing production of brass sheets in India.

Kamani Engineering Corporation Ltd.

Office: Kamani Chambers, Nicol Road, Ballard Estate, Bombay. *Works*: Bombay, Kalyan & Lahore. *Telephone*: 30586, *Telegrams*: REFINERY.

The Kamani Engineering Corporation has been registered as a public limited company with Raj. Ratna Ramji Hansraj Kamani as its Chairman. This Company has acquired 3 existing factories, *viz.*, W. Leslie & Co. (Punjab) Ltd., Lahore, (2) W. Leslie & Co., (Bombay) Ltd., Bombay, and (3) Kamani Enamel Industries Ltd., Kalyan, Bombay.

The authorised capital of the Company is Rs. 1,50,00,000 and the present issue of share capital has been Rs. 60,00,000.

LAHORE FACTORY.

This factory is a full-fledged and well equipped modern factory manufacturing all kinds of hand-tools and implements. It is equipped with Muffle furnaces, pyrometers and up-to-date equipment for heat treatment of tools and implements. It also undertakes rolling and drawing of bars and rods of brass, copper, steel, etc. upto 3″ size.

The main departments in the factory are (1) Rolling Mill (2) Foundry and Machine shop (3) Smithy shop (4) Augers (5) Agricultural implements (6) Malleable castings.

BOMBAY FACTORY

During the pre-war years the factory was fabricating brass, copper and aluminium utensils for the civil market. Owing to the very great demand of war on all industries, the factory had to switch on to the requirements of Defence Services for jugs, mugs, basins, comodes, soup plates, tin mess etc.

The Engineering Corporation, as a part of its development scheme, proposes to instal Electric Steel Furnace for the manufacture of machinery and machinery parts at Bombay. This new company also proposes to undertake in course of time the manufacture of Sugar Mill Machinery, Power Alcohol Plant, Vegetable Ghee Plant, Rolling Mill Plant and Agricultural

Machinery etc., as also various machinery parts of Railways, Textile and other industries in the country.

KALYAN FACTORY

This factory at Kalyan is manufacturing all kinds of Enamelware, such as, basins, mugs, jugs, soup plates, hospital ware etc. With the installation of a modern Enamel Plant at Bombay, as is proposed by the Engineering Corporation it would be possible to meet the growing demand for Enamelware in the country. The manufacture of Enamelware in India also holds out prospects of export to nearby countries.

Kassels Ltd.

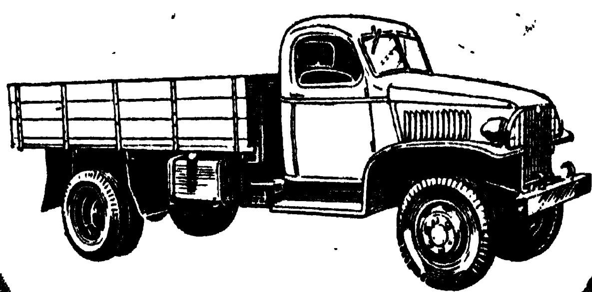
Managing Director: Mr. K. L. Teluja. *Office*: Subzi Mandi, Delhi. *Telephone*: *Office*: 5813, *Works*: 6472 *Telegrams*: KASSELS.

Introduction:—To Mr. K. L. Teluja and Mr. B. D. Law goes the credit of sponsoring the scheme of manufacturing Electric Fans at the Capital place in Delhi. Mr. Law who had previously been in the India Electric Works Ltd. of Calcutta had the advantage of having been in the top most fan manufacturing factory in the country and his services and guidance proved of great help to the Company for the Company was floated at a time of great scarcity of men and material. The promoters, however, succeeded in setting up the factory in 1945 inspite of the difficulties, and the regular production of fans started in early 1946.

Manufacture:—They are manufacturing A. C. ahd D. C. Ceiling fans of various sizes under the brands, 'Kassels' 'Lucky' and 'Azad' which are gradullay coming into repute.

Difficulties & Future outlook:—On account of the difficulties of capital goods, and the shortage of raw materials the full capacity of the company is not being utilised. However, it is expected that the raw material position would improve in the near future and the company shall be able to meet the ever increasing demand for electric fans, instruments, and other electrical appliances.

2½-3 TON G.M.C. CIVILIAN TYPE CHASSIS AND CARGO CARRIER



AVAILABLE FROM STOCK IN INDIA

The 6-wheeler, 2-axle Chassis is ideal for passenger or load-carrier bodies and we supply them with wood or steel bodies.

Petrol consumption: 11 miles per gallon approx.
Wheel base 168" Tyre size: 750 × 20 heavy duty.

Our stocks also include G.M.C. Dump Trucks 10-wheeler, 3-axle capable of carrying 3 tons of sand, road-metal, coal, etc.

LARGE STOCKS OF NEW TYRES, TUBES AND SPARES AVAILABLE AT CONTROLLED PRICES TO ENSURE SUPPLIES FOR YEARS AHEAD.

Allen Berry
& COMPANY LIMITED
62, HAZRA ROAD, CALCUTTA

A DALMIA-JAIN ENTERPRISE

BRANCHES AT:

CALCUTTA:—24B, Park Street.
BOMBAY:—17-B, Elphinstone Circle.
NEW DELHI:—13-17E, Connaught Circus.
MADRAS:—110-111, Armenian Street.
LAHORE:—59, The Mall.
LUCKNOW:—32, Station Road.
PATNA:—Station Road, Bihar.
HAZARIBAGH:—1, Lepo Road, Bihar.
NAGPUR:—Veloz Building, Kingsway
DIBRUGARH:—Assam.

Kaycee Group of Industries.

Names: (1) Messrs. Kaycee Industries Ltd., Lahore, (2) The Radio Lamp Works Ltd., Karachi, (3) Messrs. Kaycee Glass Works Ltd., Shikohabad U. P. *Managing Agents*: Messrs. Kaycee & Co., Ltd. *Managing Director*: Mr. Kishenchand. *Factory Addresses*: (1) G. T. Road, Lahore, (2) Country Club Road, Karachi, (Saddar), (3) Shikohabad (U. P.) *Branch Offices*: (1) Lahore, Lakshmi Mansions, The Mall, (Head Office), (2) Bombay, Asian Building, Ballard Estate, P. O. Box No. 630, (3) Madras, Khaleeli Mansions, Mount Road, (4) Karachi, Country Club Road, (Saddar), (5) New Delhi, Hailey Road, (6) Calcutta, Chittaranjan Avenue. *Telephone*: According to locality, *Telegrames*: KAYCE.

Introduction:—In the recent industrial development of the Punjab the contribution made by the Kaycee Group of Industries is a remarkable one. Mr. Kishenchand, the Managing Director of Kaycee Industries started at Lahore a private limited company under the title of Kaycee & Co., Ltd., in 1932 with a capital of Rs. 1,00,000. Mr. Kishenchand with his keen business acumen conceived a long range programme of creating a selling organisation as a prior adjunct to manufacturing programme. At that time, there was no Indian firm of any consequence with an all India organisation for the marketing of engineering products. Considering the financial resources at the disposal of the firm it was remarkable that during the course of 18 months, Messrs. Kaycee & Co., established their offices at Lahore, Bombay, Calcutta, Madras and Delhi.

In the year 1933, the firm was entrusted with the representation in India, of some important continental Manufacturers of Machinery and Plants such as Swiss Locomotive and Machine works of Winterthur and Ercole Marelli C. S. A. of Milan. After successful trading for five years, the selling organisation was consolidated and projects were launched for the manufacture of Electric Lamps and Electric Ceiling Fans.

THE RADIO LAMP WORKS LTD.

The project for the manufacture of Electric Lamps fructified in the year 1939 when a company was started under the name

and style of the Radio Lamp Works Ltd., at Karachi with a capaital of Rs. 5,00,000 which was later increased to Rs. 25,00,000. On account of the declaration of war the company had to experience many difficulties in procuring technical experts and in completing the installation. But it must be said to the credit of Company's Indian technical experts that they steered the factory through the trial period and brought it to its full stature in the year 1941. This was the time when all the lamp factories in India had begun to feel the shortage of raw materials such as glass shells, brass caps, filament wire and Moly wire.

The Company has now put up a new mass production plant at Shikohabad, with an optimum production of 25000 lamps per day. Their range of manufacture besides general service and train lighting lamps will include Automobile bulbs and flourescent lamps and fixtures.

With their associated glass works in proximity they will be in a unique position in regard to their overall cost of production.

MESSRS. KAYCEE GLASS WORKS LTD.

Mention has already been made of the acute shortage of glass shells for the manufacture of electric bulbs on account of the war. In order to cope with the situation the house of Kaycee started a glass factory at Shikohabad in 1942 with a capital of Rs. 5,00,000. With the untiring efforts of the Company's Indian Technicians and the technical collaboration and guidance of the Glass Technologist of the Government of U. P. their Shikohabad factory succeeded in producing good quality glass shells within a short period of 6 months. The achievement, considering the difficulties in procuring materials created by the war, was remarkable.

To enable the factory to produce shells of quality comparable to imported ones and at competitive prices orders have now been placed for fully automatic machines, of the very latest design from America. These machines along with auxiliaries are expected to be in operation early. This new plant

will produce 60,000 shells a day besides other high class hollow tablewares.

MESSRS. KAYCEE INDUSTRIES LTD.

In the year 1943, Kaycee & Co., Ltd., as Managing Agents floated Kaycee Industries Ltd., who have working capital of Rs. 35,00,000. The main works situated at Lahore, is the largest of its kind in Northern India. They have comprehensive programme of manufacture of electrical machinery and equipment including motors, generators, forge blowers—pumping sets—measuring instruments etc. They have already established successful manufacture of Ventilating fans, Exhaust fans, Sirens etc. Their mechanical division is engaged in the manufacture of expanded metal, under the project sponsored by the Government of India. The expanded metal plant is of the latest type of American origin, having a capacity of 3,000 Tons per year.

This division has also in hand a project for the manufacture of Nuts, Bolts and Rivets.

Their Instrument works at Poona, orginally established in 1922, is producing high quality Precision Instruments such as Pyrometers, Galvanometers, Spectrometers and other Laboratory Apparatus. The latest addition to their activities is the manufacture of Moving Iron and Moving Coil Ammeters and Voltmeters.

Conclusion :—Thus the Kaycee Group of Industries are run with a capital of about Rs. 75,00,000 and offer employment to over 600 workers and technicians. They have to play a great part in the post-war industrial development of the country. The contribution made by this group to the industrialisation of the country has been remarkable and they deserve every assistance from the Government to weather any storm that may beset them in the initial stages.



Mr. Rajkumar
Banker and Industrialist
Proprietor
Messrs. Khemchand Rajkumar
Jullunder City

Messrs. Khem Chand Raj Kumar.

Proprietor: Khem Chand Raj Kumar. *Office & Works*: Jullundur City. *Telephone*: 295, *Telegrams*: RAJ KUMAR, Jullundur.

Introduction :—This firm of Messrs. Khem Chand Raj Kumar was started in the year 1900. Manufacture of locks was the first thing taken up by the firm. Several other lines were also taken up later on so that in addition to the locks the firm is at present manufacturing buckets, trunks, uniform cases heaters, pans, sheet metal, brass and bib cocks, vermicille machines, presses hollowware items. It also undertakes drum making, galvanising and electroplating work.

The concern to-day has over 300 workmen.

Present Position :—The output of the concern is about 2 tons of bolts and nuts and washers, 500 buckets and tubs per day. Besides this, the concern is capable of manufacturing a large number of utensils, heaters, coolers, steel pipe chairs, trunks, uniform cases, stationery boxes, cash boxes, ice boxes etc., etc.

Khiali Ram Gujjar Mall.

Proprietor: Mr. Gujjermall Gupta. *Office & Works*: High Street, Montgomery (Pb). *Telephone*: 180, *Telegrams*: KHIALIRAM GUJJARMALL.

The factory was established in the year 1938 with a capital of Rs. 150,000 for the manufacture of Chaff Cutter blades, weights and measures, Buckets, Tubs and Cutlery etc. It has 65 workers working in the factory.

Messrs. Kirloskar Brothers Ltd.

Managing Director: Mr. Luxmanrao Kirloskar. *Office & Works*: Kirloskarvadi, Dist., Satara. *Telegrams*: KIRLOSKAR.

Introduction :—The factory of Messrs. Kirloskar Brothers Limited is situated at Kirloskarvadi, Satara, in the province of Bombay. It was founded by Mr. Laxmanrao Kirloskar, who is still its Managing Director. Originally they manufactured buttons and pill boxes only but later on they started dealing in cycles and wind mills also. Thereafter they took up the manufacture of hand chaff-cutters also using a couple of drilling machines, a small lathe, an emery grinder and a one-horse-power engine. It was then that they erected a factory also and started the production of Iron Ploughs. Subsequently circumstances forced them to shift the factory to Kundal Station (now Kirloskarvadi). It is now a limited Company with a paid up capital of Rs. 16,47,076.

Manufactures :—The factory is producing more than 20 different types of ploughs. To these have been added many other agricultural implements such as harrows, chaffcutters, scrappers, and levellers, maize shellers, corn winnowers, motes, bullock and hand driven rahats, sugar-cane crushers, and groundnut decorticators. Hand and power pumps for different uses are supplied. The steel furniture section is engaged on chairs, tables, shelves, hospital and office equipment, bed-lockers, cots, cradles, and spring-bedsteads, and miscellaneous products ranging from nuts and bolts to municipal water-carts.

These are all selling in the market under their well known brand 'Kirloskar'. About a thousand workers are working in the factory and their annual turn-over is measured in several lacs of rupees. They are engaged in the manufacture of electric motors also for which a new company has now been started.

Krishnalal Thirani & Co., Ltd.

Managing Director: Mr. Krishnalal Thirani. *Factory*: 46, Barackpore Trunk Road. *Office*: 8, Royal Exchange Place, Calcutta. *Telephone*: Cal. 4657. *Telegram*: THIRANICO.

Introduction:—Messrs. Krishna Lal Thirani & Co., Ltd., came to be established in the year 1934 as a Public Limited Co. The capital investment in the factory is more than Rs. 3,00,000. They had obtained machinery from abroad but due to certain difficulties actual production could not begin before September 1938. Just a year after came the world war II which created great demand for various kinds of abrasives. Their products were tested and the firm was listed as an approved Contractor of I.S.S., D.G.M.P., C.C.P.M. Railway and other civil departments.

Production:—The products of Messrs. Krishnalal Thirani & Co., Ltd., include Glass paper, emery paper, belts, glass cloths, emery cloth, Garnet cloth, Carborundum cloth and cloth and paper combination and Discs. At present they manufacture 39,000 reams of sand paper, 2,000 reams of Emery paper, 23,000 reams of Emery cloth, 37,000 reams of Glass and 25,000 reams of other items.

Equipment:—The machinery with which they have been working is automatic and is run with electricity. The firm has got a small workshop of its own attached to the works for minor and emergent repairs.

Kushmika Iron Works Ltd.

Managing Director: Mr. Shibanitosh Ghattack. *Office*: 3, Maharshi Debendra Road, Calcutta. *Works*: 70/73, Jeliapara Lane, Salkia, Howrah. *Telephone*: *Office*: B.B. '4541, *Works*: Howrah 261. *Telegrams*: FERACIER.

They are structural and Mechanical Engineers of various descriptions.

Ludhiana Steel Rolling Mills.

Proprietor: Mr. Sohan Lal Jain, *Office & Factory*: G. T. Road, Miller Gunj, *Telephone*: 37.

Introduction:—The factory was started in the year 1939 by Seth Sohan Lal Jain. It has got a well equipped workshop which was originally meant for the maintenance of the mills but was during the war expanded to undertake fabrication work for the War Department.

Later Developments:—Recently an Agricultural Department has also been added for the manufacture of Agricultural Implements such as Juice Boiling Pans, Persian Wheels, Buckets, Chains, Troughs, Taslas, Chaff cutters etc. They are enlisted as approved contractors of the Agricultural Department of the Punjab Government.

Manufactures:—

I. Round & Square Steed Rods upto 1/2″.

II. Steel Hoops from 10 to 20 Gauge.

III. All sizes of Bolts, Nuts & Rivets.

IV. Electric Pole Fittings.

V. All kinds of Agricultural Implements.

VI. Cycle & Pram parts.

New Schemes :—The mill is soon going to be converted into a joint stock company and the factory removed to a new and more spacious site where additional machinery imported from the U. K. or the U. S. A. will be installed.

The Machine Manufacturing Co., Ltd.

Managing Agents: Rai Sahib J. P. Agarwala. *Office & Works*: Lillooah, Howrah. *Telephone*: Howrah 477.

Manufactures :—They manufacture machinery and machine parts.

Madras Enamel Works Ltd.

Managing Agents: Messrs. Rao & Brahman. *Office & Works*: 65, Sydenhamas Road, P. T. Madras. *Telephone*: 2646, *Telegrams*: ENAMEL SIGN.

The factory was established in 1934 and has been engaged in enamelling sign-boards and wares such as household utensils, hospital requisites etc.

Mantri Machinery Factory Ltd.

Managing Director: Mr. H. P. Mantri. *Head Office*: 8, Royal Exchange Place, Calcutta. *Factory*: 8, Barrackpore Trunk Road, Kamarhatty. *Telephone*: Cal. 5859. *Telegrams*: HAPPYHOME.

Introduction:—The Company was floated in the year 1939 for the manufacture of bolts and nuts. It improted a German Automatic Bolt and Nut Plant, which was installed in the year 1940. But after working the plant for a very small period, the Government of India desired its loan for the production of war materials, and the plant was finally handed over to the Government in the year 1942.

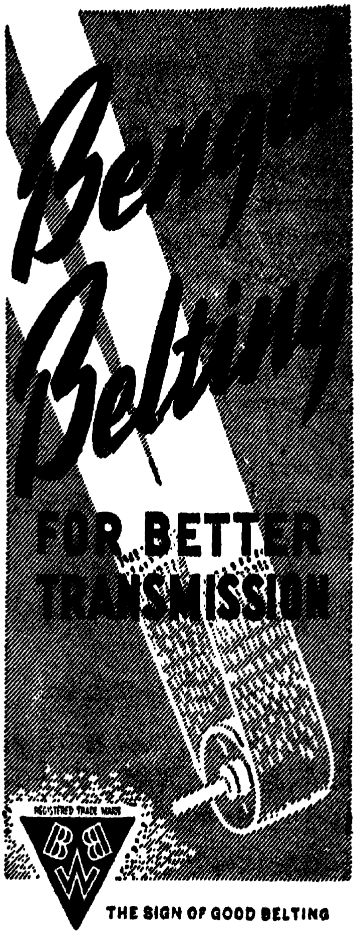
Equipment & Production:—The machines of the plant are highly automatic and are capable of producing approximately 200 tons bolts and nuts per month.

The plant has very recently been released by the Government and they have started the production of bolts and nuts for civilian consumption.

Mapara Parekh & Co.

Proprietors: N. H. Mapara and K. N. Parekh. *Office & Works*: Ghod Bunder Road, Santacruz, P. O. Juhu, Bombay 25. *Telephone*: 68202, *Telegrams*: SIMPSONS.

Activities:—The factory was established in the year 1944 and has developed a wide range of activity. It is the only firm in the country manufacturing Simpson's Producer Gas Plants. Other lines of their manufacture include Imperial Gallon Containers, Water Tanks, Baby Cars, Scooters, Folding Stools, Reservoirs, Steel Cabinets and Office Furniture. They also undertake structural engineering works and execute various other jobs from Railways and Supply Department of the Government of India.


Bengal Belting
FOR BETTER TRANSMISSION
THE SIGN OF GOOD BELTING



There is no end to the numerous applications of metal spraying in every branch of Industry

Metal Spraying Products.

Metal Press Works Ltd.

Managing Agents: Gajanand Ram Protap & Co. *Office & Works*: 156, Victoria Road, P. O. Baranagore, 24, Parganas.

The factory was started in 1944 and is engaged in the manufacture of various types of sheet metal containers. It has a capital investment of 10 lacs of rupees and has about 100 workmen in its employ.

Metal Spraying Products.

Managing Agents: Messrs. Saraogi Bros. *Office*: 8, Royal Exchange Place, Calcutta. *Works*: 4, Howrah Road, Howrah. *Telephone*: PK. 4150, *Telegrams*: METSPRAY.

Introduction:—This private firm was started in the year 1943 with a capital of Rs. 300,000 and has the credit of being the first to introduce Metal Spraying in India.

Activities:—The firm is mainly concerned with metal spraying for which purpose it manufactures a metal spraying pistol under the trade name of 'MSP'. It also manufactures a large part of the ancillary equipment required such as Sand-blasting machines and Air Filters.

Metal Spraying:—It is a process of applying molten metal to a surface under air pressure and the main instrument is a pistol or gun that both melts the metal, commonly by the oxy-acetylene flame, and throws it on to the surface to be sprayed. Any metal can be sprayed on to any surface even glass, cloth, paper etc., that has been suitably prepared.

It will be realised that the applications of such a process must be numerous and, indeed, metal spraying has spread over a wide field of industry in the United Kingdom and the U. S. A., in particular. Here too, in India the list of industries to-day applying Metal Spraying include Breweries and Distilleries, Chemical Works, Collieries, Cotton and Textile Mills, Engineering Companies, Jute Mills, Flour Mills, Oil

Refineries, Mines, Ordnance factories and Arsenals, Paper Mills, Railways, Ship Building and Sugar Mills, Transport Companies, Tanneries, and Leather Works, Tobacco Factories etc.

Broadly speaking, metal spraying is applied in the rebuilding of worn machinery like shaftings, rams, rollers, bearings, pistons, etc., in the filling of blow holes in castings, and in the field of anti-corrosion work either chemical or atmospheric, such as fermenting vats, petrol tanks, food containers, under-carriages, and marine and constructional work of all descriptions. It has also a large field of utility in the decorative sphere. The process effects a considerable economy in replacement and maintenance costs. In short, it is of the greatest utility in the repair, reinforcement, restoration and protection of machinery.

Metropole Works.

Managing Proprietor: Mr. N. C. Bhatia. *Head Office*: Verka (Amritsar). *Works*: Verka (Amritsar). *Telephone*: 743, *Telegrams*: 'METROPOLE', Amritsar.

Introduction:—The factory started in the year 1934 as Major Contractors to Hydro Electric Branch, Punjab for supply of H. T. and L. T. Line Materials, and for the erection of Transmission Towers.

They have since supplied various stores such as Motors, Electric fans, Lead tee boxes, Aluminium Link tee boxes, Galvanized Mild Steel Briddle Clamps and Vibration Damper Clamps, and numerous other miscellaneous stores to the P. W. D. Electricity Branch. When the war broke out they executed a large number of Military War Orders of the nature of high priority and against operational demands for supply of various types of stores, such as Electric ceiling fans, Motors-Fractional Horse Power, Grinders, Electric Drilling Machines, etc. Besides the stores manufactured for the War efforts they have been keeping pace to meet with the Civil demands also. They are specialised in the manufacture of fans of all sorts, *i.e.* ceiling fans, pedestal fans, table fans and exhaust fans. The average number of ceiling fans manufactured during the

War period has been 1,000 monthly besides Electric Motors, Drilling Machines, Polishers, Electric Blowers etc. The Number of Workmen and Staff employed during the war period had been up to 1,800 approximately.

Present Position:—The works have adequate works machinery and equipment etc., valuing rupees twenty five lacs approximately comprising of Lathes, Shaping Machines, Planning Machines, Presses, Power Presses, Cutting Machines, Slotting Machines etc., and as such, have an extensively large capacity for the manufacture of their products *i.e.* A. C. and D. C. pedestal, ceiling and Table fans, Electric Motors, Electric Bench Pattern Grinding, buffing and polishing machines, Drilling Machines, Electric Blowers, Vices, Smith Hearths, Smith Forges and Electric Line and Distribution material etc. The daily out-put of fans of all sorts goes upto 40 to 50 fans. They can undertake Casting, Welding and Galvanizing Works of every description. At present the works are manufacturing in a very large quantity Tube Well Strainers for the Punjab Irrigation department.

Messrs. Mukand Iron & Steel Works Ltd.

Managing Agents: Messrs. Jeewan Ltd., Bombay. *Head Office*: 51, Mahatma Gandhi Road, Fort, Bombay. *Branch Office*: 2-A, Elgin Road, Calcutta. *Works*: (1) Signal Hill Avenue, Mazagoan, Bombay 10, (2) Badamibagh Lahore. *Telephones*: (1) *Lahore* Office: 2828, Works: 2041, *Bombay* Office: 30027, Works: 46041, *Calcutta*: PK. 1769. *Telegrams*: (1) STEEL, Bombay, (2) JEEWAN, Lahore, (3) WHEELS, Calcutta.

Introduction:—This Public Limited Company was established in 1937. They installed Electric Arc Furnaces both at Bombay and Lahore Works for smelting and refining of steel. They have erected latest type of Muffled Annealing Furnaces. Castings annealed in them are fine specimens of technical accuracy and competence.

The War (1939):—When the war came, Mukand's entire production was switched over for Government requirements

and was controlled by the Director General of Munitions Production and the Iron and Steel Controller.

Their rolled tested steel went through the length and breadth of the country and even to the Middle East for essential military operational demands.

Manufactures :—Mukands are to-day in a position to successfully undertake steel castings of the most intricate nature, heavy or small, the quality of steel being to the required specifications. They are at present executing a number of railway orders for Wheels Centres, Draf Boxes, Buffers, Gear Wheels, Axle Boxes, etc., and they are also manufacturing certain parts of machinery for sugar, textile, and cement industries. Recently they have started the manufacture of LOOM SPINDLES. These spindles stand comparison with the best of foreign spindles. The entire process right from the manufacture of special steel, best suited for the purpose, to the polish of the finished spindles is done by themselves. This new line of manufacture has been very much appreciated by the industries concerned.

The latest achievement of Mukands is the manufacture of FILES. This is a new enterprise in the country. After a series of long and strenuous experiments Mukands are producing FILES that have stood the test of Government Laboratory and actual use and are now approved as the standard FILES. The FILES of almost all types, Flats and Squares, Bastard, Second-cut and Smooth are manufactured by them. They have installed the File-cutting machines and introduced the latest hardening and sand-blasting equipments.

Labour :—The total number of labourers employed by them is about two thousands, out of which about 800 are skilled labourers.

Future Plans :—Their post-war programme can be summarised on the following lines :—

1. Expansion of Steel Castings of various compositions.
2. Drawing of Wires of all types including wire-springs and high tensile wires and wire ropes.

3. Manufacture of all types and sizes of files and spindles from the special steel production from their own Electric Steel Furnace.

4. Manufacture of High Carbon Tool Steel and Spring Steel of various sizes and specifications.

5. Special Steels like Manganese Steel, Stainless Steel, High Speed Steel and other special alloy-steels, useful in telephone, telegraph, radio manufacturing industries and motor and aircraft industries.

6. Mass production of about 3,000 tons per month of Commercial Steel Bars and Structurals.

The Mysore Iron & Steel Works.

Proprietors: The Government of Mysore. *Office & Works*: Bhadravati, Mysore. *Telegrams*: MYSIRON.

Introduction:—The construction of the Mysore Iron Works at Bhadravati, was started in the year 1918. The construction was completed by the end of 1922 and the works started operations in early 1923. The plant originally comprised of a *Blast Furnace* and a *Wood Distillation Plant only*. Subsequent additions have continued and the works at present comprise:

A modern Charcoal Blast Furnace with a capacity of 80 tons of pig iron per day.

A Wood Distillation Plant with 16 oven retorts for carbonising about 250 tons of wood per day together with—

(*a*) a By-Product Recovery Plant for treating the pyroligneous liquor obtained, and

(*b*) a Tar Distillation Plant.

A Pipe Foundry with a capacity of about 10 tons of C. I. Pipes to B. S. S. per day.

A General Foundry for making Pipe Specials and miscellaneous iron castings.

Two Basic Open-hearth Furnaces each with a capacity of 25-30 tons per heat.

A Rolling Mill for the conversion of the steel ingots to Mild Steel Sections, with a capacity of 80-100 tons per day.

A plant for manufacturing Portland Cement to B. S. S., with a capacity of 60 tons per day.

Electric Furnaces and a Steel Foundry for manufacturing manganese, carbon and alloy steel castings.

A Ferro-Alloy Plant consisting of two furnaces with a capacity of 900—1,000 tons of Ferro-silicon per annum.

The other sections consist of a Structural Shop for the fabrication of steel structure for buildings, electric transmission towers, etc., and Brick Plant for manufacturing bricks and refractories.

The Plant is provided with a Pattern Shop, Machine Shop, Boiler House, Power House and other auxiliaries.

A gravitational ropeway down the Kemmangandi Hills, about 25 miles from the Works, and a net-work of tramways extending to the neighbouring forest areas serve to bring the ore, limestone and wood required for operation.

A Formaldehyde Plant with a capacity of about 4-5 tons per month and a Bakelite Plant for the manufacture of synthetic resins have also been installed.

A pilot plant for the manufacture of Acetic Acid is also put up. Sodium Acetate, Aluminium Acetate and Para-Formaldehyde are also being manufactured.

Post-War Developments:—The following developments and additions to the plant are under consideration:—

(1) *Pig Iron*—Increasing the output of pig iron almost immediately to 42,000 tons per annum by installation of an Electric Pig Iron Furnace of 15,000 K. V. A. capacity with a rated capacity of about 140 tons per day. It is proposed to duplicate the plant and increase the pig iron capacity to 1,00,000 tons per annum as early as possible.

(2) *Steel*—Following the installation of the Electric Pig Iron Furnace, both the existing Open-hearth Furnaces will be put into operation and the steel ingot production will be raised to 60,000 tons per annum.

A target production of 1,00,000 tons of finished steel is being aimed at through the installation of cogging and structural mills, tube mill and sheet mill.

(3) *Tube Mill*—The proposed capacity is 10,000 to 12,000 tons of seamless tubes per annum.

(4) *Steel Foundry.*—The Steel Foundry is being expanded to be able to meet the entire demand of steel castings in South

India, inclusive of the requirements of the Railways. An additional machine shop for the steel foundry is under erection.

(5) *Special Steels.*—The manufacture of stainless steel is under active consideration.

(6) *Glacial Acetic Acid.*—Negotiations are under way for the purchase and erection of a plant for the manufacture of Glacial Acetic Acid direct from pyroligneous liquors.

(7) *Cement Plant.*—To meet the growing demand for cement, it is proposed to instal an additional plant of a rated capacity of 150 tons per day and gradually increase the production to about 1,00,000 tons per annum.

The Works provide employment for about 8,000 people.

The Mysore Kirloskar Ltd.

Managing Agents: Messrs. Kirloskar Brothers Ltd. *Office & Works*: Harihar. (Mysore State). *Telegrams*: MYTOOL.

Introduction:—The Mysore Kirloskar Ltd., was started in the year 1941. At this time on account of the war going on the demand for machine tools was naturally large so that a new field was opened before the Indian manufacturers to manufacture machine tools.

Messrs. Kirloskar Brothers Ltd., who had been experimenting with the manufacture of machine tools in pre-war days established a factory at Harihar in the State of Mysore with a capital of rupees ten lakhs and started functioning early in 1942.

As the Government of India also wanted the development of this industry, they gave balancing plants to five large machine tool manufacturers in India, the Mysore Kirloskar Ltd., being one of them. This enabled the concern to step up production with added impetus on a still larger scale.

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Manufactures:—The Mysore Kirloskar Ltd., manufacture lathes, drilling and planing machines, shaping machines and power presses. They are developing a new capstan lathe and are further considering the manufacture of small turret lathes and milling machines. The Machine Tool Controller of the Government of India has placed their manufactures in the first grade. Some of the machine tools manufactured by them are of the following specifications.

Lathes	4″/4½″ centres	Grade I
„	6″/6½″ „	„ I
„	9″/9½″ „	„ I
Drilling Machines ¼″ capacity pillar type		„ I
Milling Machines 18″ Edgwici Horizontal		„ I
Shaping Machines 12″ Stroke		„ I

The Mysore Premier Metal Factory.

Proprietor: Mr. Himchand Shah and Mr. Keshab Lall Shah. *Office*: 124, Mint Street, G. T. Madras. *Works*: Tondiapet. *Telephone*: 2535. *Telegrams*: SUNBRAND.

Introduction:—The Mysore Premier Metal Factory was started in Bangalore 30 years ago for manufacturing brass utensils. It was purchased by the present owners in 1926 and was run at Bangalore until the middle of 1939. On account of the exigencies of the war, the Government acquired the site where the factory was located and it was decided to locate the factory at Madras where it has been working since June 1939 with a capital of over Rs. 5 lakhs.

It was in 1936 when Mr. Himchand Shah, after the death of the former proprietor, acquired the factory.

"Sunbrand", stainless steel articles made at the factory have acquired a good reputation. The other lines of their manufacture are:—aluminium ware, brass utensils, copper ware, German Silver Ware, brass, aluminium and German silver castings of all descriptions. They also manufacture industrial and hospital equipment such as steel condensers and heaters. They as well undertake electro-plating in nickle, silver, gold and copper. They are pioneers in introducing stainless steel articles for household purposes. The factory is one of the selected manufacturers by the Government under the Brass Ware Control Scheme.

Messrs. Naraindas Industries Ltd.

Managing Agents: Messrs. Gidwaney's Company. *Office & Works*: 87-A, The Mall, Lahore. *Telephone*: 3066, *Telegrams*: NARAINSTRY.

Introduction:—Naraindas Industries Ltd., was started in 1943, with an authorised capital of Rs. 5,00,000/- and paid-up-capital of about Rs. 3,00,000/-. The initial programme of their production included wood screws and manufacture of relevant machinery under the patronage of the Director General of Munitions Production.

Soon after, in December, 1943, the D. G. M. P. placed huge orders for wood-screws with them for which purpose they fabricated some machinery. On account of certain circumstances this order was cancelled and they were allowed to manufacture wood screws for the civilian market.

With a view to extending their factory and their business they obtained licence for the fabrication of roll-threaders and wire nail machines for the fabrication of machine screws and wire nails respectively.

Manufactures :—As has already been pointed out Messrs. Naraindas Industries manufacture wood screws, machine screws and nails. They are also equipped for the fabrication of machinery and they have already fabricated most of the machinery used by them.

Messrs. Narayan Engineering.

Proprietors: Mr. Gajanand Jalan, Mr. Amar Chand Jalan and Mr. Indrasen Roy. *Office*: 60-A, Kali Krishna Tagore Street, Calcutta. *Works*: 108-1, Benares Road, Salkia (Howrah). *Telephone*: *Office*: B.B. 1916, *Factory*: Howrah 39, *Telegrams*: NATURE.

Manufactures :—They manufacture machinery and machine parts.

The National Iron & Steel Co., Ltd.

Managing Agents: Messrs. Nursing & Co. *Office*: Stephen House, 4, Dalhousie Square, Calcutta. *Works*: Belur (E. I. R.) Howrah. *Telephone*: *Office*: Cal. 3194, *Works*: Howrah 670, *Telegrams*: NASCOWORKS.

Introduction :—The National Iron & Steel Co., Ltd., was floated in 1935 with an authorised capital of Rs. 50,00,000 the primary object being to utilise the huge quantity of scrap available in India which till then found its way to Japan to feed the Steel Industry there. In 1934 Mr. J. N. Agarwal, a senior

partner of Messrs. Nursing & Co., went to Japan to gather first-hand knowledge and experience of the working of re-rolling industry in that country and there he negotiated for the purchase of a rolling plant. Eventually in 1937 a 10 ton electric furnace was set up for making steel from scrap and then rolling it into finished sections in the rolling mills. In the beginning, the management secured Japanese co-operation, but it did not last long. The outbreak of the war gave them an opportunity to expand their activity and brought them closer to the goal visualised by the founders.

Very recently, another 1 ton Electric Furnace has been installed for the manufacture of high quality steel.

The war afforded the Company an opportunity for making its own open-hearth steel billets. At the instance of the Government, it has commenced construction of a 25 ton open-hearth Furnace for the manufacture of M. S. billets which shall be in production no sooner the mechanical appliances are made available from U. K. It is expected that when this furnace is in operation, the production of steel will increase five times. Already it is recognised as A class rolling mill.

Production:—The capacity of the rolling mill is about 4,000 tons per month varying from 1/4″ to 2″. The output of the Electric Furnace is about 2000 tons per month. During the period of the war the production of the Rolling Mills was confined to smaller sections only *viz.*, rounds, squares and flats. The heavy demand of these sections would not permit rolling of angles, channels, tees, etc.—which is, however, in the purview of the management.

The Electric Furnace is equipped for manufacturing quality steel, namely, Spring Steel, Tool Steel, High Carbon Steel and other alloy steels.

In addition to the re-rollable scrap and steel ingots made at the works, the Rolling Mill uses a large quantity of M. S. Billets for which it depends on the local main steel producers and to some extent on imports. The firm have, however, their own plan under way to manufacture the same.

Departments : Foundry :—Alongside the Rolling Mills, it has laid out a big steel-foundry with a monthly output capacity of 200 tons of black castings and near about 150 tons of fettled castings. The foundry is 75 per cent. engaged in the manufacture of wagon components for all the State Railways principally the East Indian Railway.

C. I. Foundry :—For the maintenance side of the works, there is a Cast Iron Foundry with a capacity of 250 tons per month. In addition to the maintenance job, this foundry is capable of doing substantial work for the market.

Brass Foundry :—The brass foundry was also designed originally for the purpose of maintenance, but it is now being extended to undertake manufacture of all kinds of non-ferrous rollings and sheet mills.

Bolts and Nuts Shop :—Attached to the main Works is Bolts and Nuts Shop which is fabricating bolts, nuts dog-spikes, rivets etc. The output is 30 to 50 tons a month.

Machine Shop :—This shop has been developed to perform machining jobs of all varieties. This shop also turns out machines for maintenance of the main Works.

The management are contemplating the manufacture of high class machines which are not being manufactured in India at the present.

Recently they have been working a Wire Rope Plant, part of which has already been completed.

Structural Shop :—The Structural Shop of the National Iron was originally meant for the erection and construction of the Works itself. This shop has done construction work for the sister concern *viz.*, the National Screw and Wire Ltd. The open-hearth furnace of the factory is also the work of this shop. The structural shop has done several jobs of steel fabrication for the Government also. The management are also earnest in developing a fully equipped structural engineering factory for fabrication of building structurals, bridges etc. At present it undertakes all kinds of structural fabrication and the capacity of the shop, as it is, ranges from 250 to 300 tons per manth. The management are negotiating purchase and installation of

additional plants with a view to supplementing the output of the shop to the tune of 400 to 500 tons per month.

New Schemes :—The management have under consideration the manufacture of shafting, steel pipes and other conveying materials also. Further they have in view the devélopment of a first class smithy and forging shop for the manufacture of all kinds of tools, agricultural and tea garden implements which form considerable part of India's import trade. They have also in hand a scheme for setting up a roll foundry. They aim at making the works complete by itself, in as much as to make it self-sufficient for the manufacture of all kinds of mechanical and power plants embodying the latest scientific discoveries and achievements.

Labour :—The labour employed in 1936 was 278. Now it engages 400 to 500 skilled and unskilled labourers in the various departments.

The National Insulated Cable Co. of India Ltd.

Managing Agents: Messrs. Associated Industrial Development Company Ltd. *Office*: Stephen House, Dalhousie Square, Calcutta. *Works*: (1) Mehgaon, C. P. (2) Mulajore near Calcutta. *Telephone*: Cal. 5660, *Telegrams*: MEGOHM.

Introduction :—The National Insulated Cable Co. of India Ltd. was established in the year 1942 for the manufacture of electric wires and cables of various types. Although there was one cable company, The Indian Cable Company Limited at Jamshedpur, theirs was the first concern managed and financed purely by Indians. To meet the requirements of the military conveniently the Government desired the factory to be established in C. P. so that one factory was established at Mehgaon, Katni, C. P. and another at Mulajore near Calcutta which is by far the largest unit in the whole of East except Japan. Government assistance was available to obtain most up-to-date and modern equipment from the U. K. For the factory in C. P. the Government helped them to obtain the wire drawing plant of Messrs. Baron Cawther.

Production:—Ever since 1943, the Company has been engaged in the production of pure copper conductors of various qualities.

All the materials required by the Company are available locally except only the Electrolytic Copper wires the production of which together with brass rods has now been taken up by their sister concern, 'National Rolling Mills Ltd.'

Future Outlook:—With the termination of the hostilities their products are now available for the civilian market, public utility companies, and railways etc. With so many expansion schemes for electrical developments, the demand for their products is bound to increase considerably.

The National Metal Industries. Ltd.

Managing Agents: Messrs. Amritlal Ojha & Co., Ltd. *Office*: Security House, 102-A, Clive Street, Calcutta. *Works*: 1, Bagzala Road, Dum Dum. *Telephone*: *Office*: Cal. 6476-77, *Works*: Dum Dum 5, *Telegrams*: NAMETAL, Calcutta.

Introduction:—The National Metal Industries Limited were established in 1931 with a capital of Rs. 1 lakh. In 1944 the management passed on into the hands of the present owners and the capital was increased to Rs. 10 lakhs, 7½ lakhs being subscribed and paid-up. The factory has been re-organised and is working day and night shifts.

The factory has various types of power saving, milling, shaping, and polishing machines. It has also got a non-ferrous foundry and equipment for electro plating, soldering etc.

Manufactures:—The National Metal Industries Limited manufacture umbrella fittings of all kinds, building materials, water fittings, gun metal, brass fittings, buckets, drums, tug

manufacturing hinges, rivets, ferrous and non-ferrous materials, washers, bolts, nuts, screws, and locks etc.

Present Position:—The Company is at present working to its capacity and employs about 400 workers. When the extensions are completed, the Company expects to employ over 1,000 workers.

The National Rolling Mills Ltd.

Managing Agents: The Associated Industrial Development Co., Ltd. *Office*: Stephen House, 4, Dalhousie Square, Calcutta. *Works*: Mulajore *Via* Shamnagar, B. & A. Rly. *Telephone*: Cal. 5660 (10 lines). *Telegrams*: MEGOHM.

Introduction:—This Company was established in July 1942 for the purpose of manufacturing Electrolytic Copper Rods in sizes and lengths suitable for the Electric Cable and Wire Manufacturing industries.

Prior to the establishment of this Company, all Copper Rods had to be imported from abroad. The sponsors of this Company, therefore, decided that it would be in the interest of India and furtherance of war efforts to establish a Non-ferrous Hot Rod Rolling Mill in India. Fortunately a complete Rolling Mill plant was available for immediate shipment, and arrangements were made for importing the Mill.

The Rolling Mill of the Company is the first of its kind in India. With the manufacture of Copper Rods for the Cable Manufacturing Industries, the country now has to import only Electrolytic Wire Bars. The mill is equipped with up-to-date machinery and is rolling at present Electrolytic Copper Wire Bars and rods of sizes from 1/4″ upwards.

Activity:—At present the Mill is engaged in rolling Electrolytic Copper Rods in commercial lengths from Electrolytic Copper Wire Bars. It is also in a position to undertake similar manufactures in Brass, Aluminium and other Non-ferrous Metals.

This Company is equipped to meet the entire demands of the Cable Industry in India and do away with the necessity of importing Copper Rods from abroad.

The National Sand Paper Mills (India) Ltd.

Proprietor: Mr. Narindar Nath Mohan. *Factory & Office*: Rawalpindi. *Telephone*: 706, *Telegram*: SERVICE.

Introduction:—The National Sand Paper Mills (India) Ltd. was started in 1941 as a public limited company and is located in Rawalpindi. The capital investment in the factory is Rs. 500,000.

Equipment:—The factory is equipped with machines such as the gluing machine, printing machine, cooling box, Pneumatic section table, Festooning and Drawing Apparatus, Cutting machine and Gluing boiler etc. The sieving process has been improved by the addition of new machines with satisfactory results.

Production:—During the war the factory enjoyed a period of prosperity and worked to its entire capacity to meet the heavy civil and military demands.

The items of their manufacture include Sand paper, Emery paper, Emery cloth and Glass Cloth, Emery tape etc.

The National Screw & Wire Products Ltd.

Managing Agents: Messrs. Nursing & Co. *Office*: Stephen House, 4, Dalhousie Square, Calcutta. *Works*: Belur (E. I. R.). *Telephone*: *Office*: Cal. 3194, *Factory*: Howrah 670, *Telegrams*: NASCO.

Introduction:—The National Screw & Wire Products Ltd., was floated in the year 1941 at the instance of the Supply Department of the Government of India for fabrication of wire, nails and screws both ferrous and non-ferrous. The authorised capital of this concern is Rs. 20,00,000.

The plant and machinery of the company were procured from within India through the intervention of the Government from Messrs. Devidas Jethanand & Co. of Karachi who had purchased them some time back from Germany.

The National Screw & Wire Products have three departments *viz*:—

(1) Wire Drawing,

(2) Nails &

(3) Screws.

Items of Manufacture:—Among the smaller producers of wires and nails the National Screw & Wire Producers Ltd., is one of the few properly organised firms. The capacity of the Wire Drawing Section as already pointed out is about 100 to 150 tons per month; that of the Nails between 50 to 70 tons per month; and that of the Screws is 2,88,000 pieces per month. The capacity of the respective departments, however, depends on the gauge or size of the materials they fabricate.

The products are manufactured to the Indian Standard Specification and are capable of being further improved.

The raw materials required for the manufacture of wires and nails are manufactured by their sister concern the National Iron and Steel Co., Ltd.

Future Outlook:—They have decided to set up a Wire Rope Plant also which is being manufactured for them by the National Iron & Steel Co., Ltd., and is expected to be in operation in the very near future.

There is also a non-ferrous foundry which is being extended to provide raw materials for non-ferrous products.

The company also possesses a plant for manufacturing shoe-tacks. It will be put into operation shortly.

Ogale Glass Works Ltd.

Managing Agents: Messrs. S. P. Ogale & Co. *Office & Works*: Ogalvadi, Dist. Satara (Aundh State). *Telegrams*: 'GLASWORKS'.

Introduction:—They started in 1914 as a proprietory concern and were converted into a limited liability Company in 1919. Till 1924 they handled only the manufacture of glass. In 1925 a Metal Section was also added to the works for the manufacture of hurricane lanterns from iron and tin sheets. Subsequently one Enamelling Department was also added. The capital invested at present is Rs. 10,00,000/-. They are equipped with about 40 power presses and 20 lathes, shapers and drilling machines manufactured locally by the Mysore Kirloskar Ltd.

Production:—At present they produce about 1,000 lanterns per day of 8 hours working and have got 400 skilled and unskilled workers working in the factory. Their 'Prabhakar' brand Hurricane Lanterns are now well known in the market and are almost as good as American Dietz Lanterns. During the war they supplied 7,00,000 lamps to the Stores Department of the Government.

Future Plans:—They intend to raise their capital to Rs. 15,00,000 in the near future and replace their present set of dies and punches with modern tools and machinery imported from abroad. They also wish to send a band of their technical men to the continent to learn the modern and economical technique and methods used in European metal industry.

Conclusion:—With the grant of protection to the industry recently announced by the Government their various schemes of expansion and improvement are likely to fructify soon and they feel confident of their ability not only to meet the Indian demand for lanterns but to be able to export also.

The O. K. Electric Works Ltd.

Managing Director: Mr. Ishwar Dutt, B.Sc. (Eng.). *Office*: G. P. O. Square, The Mall, Lahore. *Works*: Canal Park, Lahore. *Telephone*: *Office*: 2719. *Works*: 2718, *Telegrams*: OKAY.

Manufactures:—They manufacture Electric fans, motors, heating appliances, etc., and other electrical and mechanical goods.

Orient Industrial Engineering Co., Ltd.

Managing Agents: Messrs. Rungta Sons Ltd. *Office*: P-16, Kalakar Street, Calcutta. *Works*: Jugsalai, Tatanagar (Singhbhum). *Telephone*: *Office*: B.B. 3655 and 6627, *Works*: 313, Jamshedpur.

Introduction:—The Orient Industrial Engineering Co., Ltd. is one of the Rungta Group of Industries and was started in 1944 primarily for the manufacture of Telegraph Poles. Ever since the factory came into operation, the full capacity was utilised for manufacturing materials for the Supply Department of the Government of India. 7,500 tons of iron and steel materials were produced for the Department to their satisfaction.

Future Outlook:—Rai Bahadur M. G. Rungta, the Managing Director of the Company recently paid a visit to the U. K. and the U. S. A. to procure new machinery. When their plans of expansion are materialised they intend taking up the manufacture of several new items such as steel furniture, buckets, drums, wires, wire nails and screws etc.

The Oriental Mercantile Co., Ltd.

Managing Director: Mr. S. B. Dutt. *Head Office*: 36A & B, Pratapaditya Road, P. O. Kalighat, Calcutta. *Bombay Branch*: 11, Bank Street, Fort, Bombay. *Works*: 20, Justice Dwarkanath Road, Calcutta. *Telephone*: South 864, (Calcutta) 31304, (Bombay), *Telegrams*: SELLERS, Calcutta, ORIMERCO, Bombay.

The Oriental Mercantile Co., Ltd., represent the manufacture of O. M. C. Switches, O. M. C. Fans, O. M. C. batteries, O. M. C. Flushometer etc., and represent various other manufacturers in the country as their agents.

Peepul Iron & Steel Industries Ltd.

Managing Agents: Messrs. D. H. Brothers Ltd. *Office*: La-touche Road, Cawnpore. *Works*: Factory Area, Plot No. 34-35 Cawnpore. *Telephone*: *Office*: 2328, *Factory*: 2093, *Telegrams*: 'MACHINERY'.

Introduction:—The factory was established in 1941 with an authorised capital of five lakhs with the object of manufacturing small tools, valves, screw cutting tools, sugar and textile mill machinery parts, oil mill machinery, agricultural implements etc.

The production started in 1942 immediately after which the Supply Department entrusted them with a very important war work of fabricating Mat Bridge Units requiring high class engineering skill. The experience gained in this stood the factory in good stead in manufacturing Taps and Dies.

The Factory is adequately equipped with Lathes, Grinders, Planners, Shapers, Punching and Shearing, Machine, Drilling Machine, Phenutic Hammers, Heat Treatment Furnace, Gas and Electric Welding Plants, Ferrous and Non-Ferrous Moulding Furnace etc.

Manufactures:—At present the Company is regularly manufacturing the undermentioned articles:—

1. *Screw Cutting Tools*:
   (*a*) Taps, Dies, Whit-worth and Gas thread 1/8″ to 1″.
   (*b*) Screw Plates W. W. thread.
   (*c*) Tap wrenches.
2. *Sight Feed Glass Lubricator.*
3. *Spray Pumps.*
4. *Sluice Valves and Cocks.*
5. *Plummer Blocks.*
6. *Shaft Couplings.*
7. *Bench Vices.*
8. *Drilling Machine Vices.*
9. *Oil Ghannies (Bengal Type)*
10. *Sugar Cane Kolhoos.*
11. *Textile Mill Machinery Parts.*

Besides the above the Company undertakes jobs for Cast Iron & Gun Metal Casting, Forging, Welding, and Structural Jobs.

Future Outlook:—The firm has about 100 workers in its employ. It is being gradually expanded, by adding further latest and modern machine tools. To-day their factory ranks as one of the foremost manufacturing engineering concerns of the United Provinces. Some of their products have all India demand right upto Madras, but owing to raw material and transport difficulties, they are handicapped in expanding their activities. Their range of manufacture is being gradually expanded, and within a couple of years they hope to be able to feed country's substantial needs more effectively.



The Late Mr. P. N. Dutt
Founder
Messrs. P. N. Dutt & Co., Ltd.
Calcutta

P. N. Dutt & Co., Ltd.

Managing Director: Mr. P. C. Dutt. *Works*: 6, Palghat Lane, Belur, Howrah. *Office*: 3A, Raja Kali Kissen Lane, Calcutta. *Telephone*: B.B. 1768.

Introduction:—Messrs. P. N. Dutt & Co., Ltd. are the pioneers in the Machine Tool Industry. The late Mr. P. N. Dutt, the founder of the concern started a small factory for the purpose in 1931. His achievement in the die making of the most intricate type soon put him foremost in the rank of the machine tool manufacturers in the country. The firm was converted into a Private Limited Company in 1941.

Manufactures:—It is engaged in manufacturing Sheet-Metal machineries of various descriptions *e.g.*, fly presses, power presses (from 5 tons to 40 tons capacity), folding machines, shearing machines, seaming machines, punching machines etc.; ceramic machines of all types are also being manufactured and are in use throughout India.

The most notable achievement was the manufacture of complete plant for the manufacture of electric fans. Formerly these plants used to be imported from abroad at a very high cost. After years of patient research these were placed in the market and the high precision and efficiency of the machines were soon appreciated by the electrical fan manufacturers. Throughout the length and breadth of the country "Dutt's" automatic presses and auxiliary machines for manufacturing fans are in use and in great demand. Almost all the principal manufacturers of fans in India have got Dutt's machines operating in their factories.

Recent Development:—With the gradual progress made during the last fourteen years, the demand for machines increased and it was decided to expand the factory. A plot of land was acquired in Belur, Howrah, on the river Hooghly and construction of the factory started in 1945. By the end of the same year machines were imported and installed.

Messrs. Pomko Products.

Office & Works: 4/8, Duncan Road, Bombay 8. *Telephone*: 40910, *Telegrams*: AUTOHEAT.

Manufactures:—The firm was started in the year 1942 and is engaged in the manufacture of electrical domestic appliances such as kettles, irons, stoves, heaters, industrial heating equipment etc.

Pradip Lamp Works.

Proprietors: Messrs. Kallu Babu Lallu Babu, Bankers & Zamindars. *Managing Proprietor & Technical Expert*: Mr. Ravindra Krishna Rohatgi, B.Sc. (Eng.) B.H.U. *General Manager*: Mr. Ram Makund, B.Sc., LL.B. *Factory & Office*: Jay Krishna Street, Opp. Ry. Station, P. O. Begampur, Patna City.

Introduction:—Messrs. Pradip Lamp Works came into existence in 1939 for the manufacture of incandescent electric lamps for which there was a very great demand due to the scarcity conditions created by the war. Machinery which was originally intended to be brought from Germany and France had to be ordered from the U. S. A. From there also they could not import the entire machinery and raw materials. Fortunately, in 1940 the promoters of the concern succeeded in securing a brand new German plant which had been imported in 1935 by Messrs. Madalassa Glass Works but was lying idle. This together with certain automatic machines imported from America form the bulk of the plant at the present moment. Certain machines which could not be obtained from abroad were made by the Company in Calcutta. By the end of 1941 the Company had secured large quantities of raw materials such as Glass Shells, Brass Caps, Tugsten, Mandrill and Molybdenum wires etc. and also two complete chains of Lamp Machinery with a capacity of 5,000 lamps per day and testing equipment. About five lakhs of rupees were invested. In the meantime deterioration in the war situation necessitated the shifting of the factory from Calcutta to Patna in 1942. The erection of the

building and installation of the equipment took some time and the actual production could not start before 1945. It has its own gas supply arrangement, gas being generated in a gas plant of Company's own make.

The factory also owns a small mechanical workshop for maintenance and repair works. It gets its 6,000 volt electric supply from the Patna Electric Supply Company Ltd., and has got its own transforming gear of 200 K. V. A. placed in a separate building of its own.

Production:—The production capacity of the installed plant is 5,000 lamps a day of 8 hours working, but as there is shortage of raw materials it is working only a few hours a day and producing 500 lamps per day. Gas filled and vacuum lamps upto 75 watts are manufactured at present by up-to-date methods and are tested at every stage of manufacture in its own well-equipped laboratory according to B. S. Specification to ensure correct standardisation. All lamps are correctly marked with voltage and wattage for the convenience of the buying public. Manufacture of lamps of higher wattage upto 200 watts will be soon taken up.

The Company is expecting a huge supply of raw materials from the U. K. and Holland against its pending orders.

Difficulties:—Shortage of raw materials and difficulty in freight and shipping are seriously affecting the production. The suppliers of raw materials such as, Caps, Glass materials and Wires are mostly in the U. K., the U. S. A. and Holland. Though the supplies from the U. S. A. are cheaper and easier, there is Government restriction in imports from that country. Suppliers in the U. K. are very busy and their deliveries are very uncertain and unsatisfactory.

Future Plans:—After a couple of years two more chains of machines will be added to the existing plant to double the production of electric lamps including train lighting and auto-car lamps. Further plans to put up machines for making Thermoflasks, Torch bulbs, Switchboard bulbs, Radio Valves and Florescent lighting tubes etc. are also under consideration.

Considering the acute shortage of glass materials, it has been decided to install an up-to-date type of glass furnace in the near future so that the factory may be self-contained so far as its requirement of glass materials is concerned. This is the only bulky item which takes a lot of shipping or rail space and is a serious bottleneck in the production of lamps.

The Company is also trying to manufacture other raw materials like brass caps etc., and enquiries have already been sent to the suppliers of plant. A large number of electrification schemes are coming as part of the post-war development programme of the Central and Provincial Governments, which would increase the demand for electric lamps.

The Premier Automobiles Ltd.

Managing Agents: Messrs. Aeroauto Ltd., Construction House, Ballard Estate, Fort, Bombay. *Telephone*: 26036 and 21156, *Telegrams*: PREMOBILES.

Manufactures:—The Company has been formed with the object *inter alia* of manufacturing, buying, selling, importing, assembling, distributing and dealing in motor vehicles and automobiles etc.

Premier Stores Supplying Co., Ltd.

Office: 8, Royal Exchange Place, Calcutta. *Works*: 698, Circular Road, Howrah. *Telephone*: Cal. 563, *Telegrams*: ROSINTUR.

Manufactures:—They are manufacturers of bolts, nuts and rivets etc.

The Radhey Lall Steel Rolling Mills.

Managing Agents. Messrs. Radhey Lall Manni Lall. *Office*: Rajguddi, Hatia, Cawnpore. *Works*: Juhi Station, Cawnpore. *Telephone*. *Office* & *Works*: 2491, *Telegrams*. STECO.

Manufactures:—They manufacture Bars, Rods & Hoops etc.

Messrs. Raghu Engineering Works Limited.

Office & Works: 3, Ajmeri Gate, Delhi. *Telephone*: 5717 Delhi, *Telegrams*: RAGHUWORKS.

Introduction:—Messrs. Raghu Engineering Works Limited were started towards the end of 1943 by the late Mr. Bhishan Das Basil, M.I.E. (India), who was a very highly qualified Engineer. He was the retired Superintendent, Government Telegraph Workshops, Alipore, Calcutta. Mr. Basil combined in himself technical knowledge of engineering trade and business acumen of high order. During his service he founded the India Electric Works Limited (Calcutta), which is the first and one of the most important electric fan manufacturing concerns in the country. It was near about 1937 that Mr. Basil conceived the idea of manufacturing machine tools. He was also the founder of the Jay Engineering Works of Calcutta.

After remaining in Jay Engineering Works for some time, Mr. Basil needed better and wider field for his activities. With this end in view, he went to Delhi and in collaboration with Lala Hans Raj Gupta, one of the industrial magnates in Northern India, established the Raghu Engineering Works towards the end of 1943.

Manufactures:—Messrs. Raghu Engineering Works Limited began manufacture of electric fans and at present are manufacturing ceiling fans only which are of very good quality. Another line of manufacture in which the Company is interested is the manufacture of Hurricane lanterns.

Future Programme:—Messrs. Raghu Engineering Works have in hand schemes for the manufacture of table fans, fans for railway carriages, motors, train lighting sets, refrigerators, cooking ranges etc.

Rajkinson Brothers.

Proprietor: Seth Bhola Nath. *Office & Works*: Hoshiarpur Road, Jullundur City. *Telegrams*: RAJKINSON BROTHERS.

Manufactures:—The firm was started in 1939 and is engaged in the production of nuts and bolts, locks, chaff cutters and engineering stores.

Messrs. Raj Kumar (India) Ltd.

Proprietor: Mr. Raj Kumar. *Works & Office*: Jullundur City. *Telephone*: Office 295, Residence 291, *Telegrams*: RAJ KUMAR, Jullundur City.

The firm was started early in 1945. It produces hardware etc.



Mr Rajendra Kumar
Proprietor
Messrs. Rajkrison Bros.
Jullunder City

Ram Saran Das Aggarwal & Sons.

Proprietor: Mr. Ramsaran Dass & Mr. Sajjan Kumar. *Office & Works*: Tanda Road, Jullunder City. *Telegrams*: CHIMNIWALA.

Manufacture:—This private firm was started in the year 1937 for the manufacture of Brass Cocks, Iron Pressings, Persian Wheels, Buckets, Tubs, Bolts and Nuts and Agricultural Implements.

The Reliable Water Supply Service of India Ltd.

Managing Director: Mr. Vidya Prakash, C.E. *Head Office & Works*: Sanda Road, Lahore, (Punjab). *Branch Office*: Calcutta and Lucknow. *Telephone*: *Head Office*: 2882, *Branch Office*: Cal. 5011, *Telegrams*: RELIABLE, Lahore, TEJSTRANER, Calcutta.

Introduction:—The Company was started in the year 1925 by L. Tej Ram for the manufacture of strainers for tubewells which he had not been able to obtain satisfactorily from others engaged in the line at that time when he wanted them for a private irrigation scheme of his own. Himself an engineer, he devised a strainer which after his name is known as 'Tej Strainer'.

Equipment and Production:—At present the Reliable Water Supply Service of India Ltd. has about 56 boring plants and 5 Rock Drilling Power Driven machines working in different parts of the country. They have 24 Strainers manufacturing machines in their workshop which is also equipped with a large number of Turning Machines, Planing Machines, Shaping Machines, Lathes of different sizes, Pipe Rolling Machine etc. The Pipe Rolling Machine rolls sheet iron pipes in 8 ft. lengths. Theirs is the largest Pipe Rolling Plant in Northern India and has been manufactured by themselves. The biggest pipes rolled by them were 34″. In addition to the equipment detailed out above, their workshop is also equipped with a 5 ton Cupola for manufacturing iron fittings of every description.

The Company also manufactures 'Tej' Centrifugal Pumps for different capacities and heads which are working in different parts of the country.

About 400 skilled and unskilled workers are employed by them.

The daily production of strainers now ranges between 300 ft. to 400 ft. of different sizes.

Conclusion :—The provinces of Bengal, Bihar, Assam, the U. P., the Punjab and N. W. F., are all covered by the activities of the concern. During the war time, the Company executed orders for operational demands for the D. G. M. P., to the tune of nearly 80,000 ft. length. Almost all the major Government and civil projects are being entrusted to the Company and practically all the Railways in Northern India place their orders for Strainers and sinking of tubewells with them. They are also principal contractors to the Central Subsoil Section of the Government of India.

Renwick and Company Ltd.

Managing Director: Seth Mohanlal L. Shah, Calcutta. *Head Office*: Kushtia, B. A. Rly. *Works*: (1) Kushtia, (Dt. Nadia), (2) Lakshmanhati (Dt. Rajshahi).

Introduction :—The Company was first started by Mr. William Renwick, who was an engineer under Messrs. Watson & Co., Indigo Planters and Zemindar (changed to the hands of Midnapore Zemindary Co., Ltd.,) under the partnership business to manufacture sugarcane crushing mills and pans for boiling juice. The factory was first started at Lakshmanhati in the district of Rajshahi and the Head Office was transferred to Kushtia with the branch at Lakshmanhati.

Mr. Renwick with his partner in the early eighties of the nineteenth century, started this business of manufacturing sugarcane crushing mills which he realised, had a great field all over India. Mr. John Fairlie joined Mr. Renwick. Mr. W. B. Renwick, nephew of Mr. Renwick, senior, joined the firm as an assistant in the latter part of the 19th century and became a

Director in 1904 when he took the place of his uncle and subsequently he was made the senior Director. The firm was converted into a private limited company confining the shares among five European and one Indian members.

The present Directors of the Company are reputed industrialists and business magnates of the country. After they took up the work of the company in March 1945 from Mr. W. B. Renwick and others, they have been making arrangements for extension of work in the mechanical and other directions.

Manufactures:—The Company mainly manufactures agricultural implements such as sugarcane crushing mills, ploughs, handhoes, centrifugals, *gur* furnaces, power driven cane mills and juice boiling pans etc. During the war it supplied a lot of war orders. It also manufactures textile machinery parts and builds motor launches.

The Company's annual output is over 1,000 sugarcane crushing mills, 2,000 juice boiling pans and about 600 ploughs in various kinds. The building of motor launches has been stopped for want of teakwood from Burma and import of Diesel Engines from the U. K. The company has got a batch of experienced engineers to take up all sorts of work in the Mechanical Engineering Section and is competent to build launches etc. It gives employment to about 400 persons.

Saru Smelting and Refining Corporation Ltd.

Managing Agents: Seth Jugmandardass Shital Prasad Jain. *Head Office*: Sadar Bazar, Meerut (U. P.) *Branch Office*: Calcutta, Delhi, and Lahore. *Works*: Meerut and Calcutta. *Telephone*: Meerut 262, Calcutta B.B. 5308 and South 1951, *Telegrams*: METAL, Meerut: TAMBAPITAL Calcutta.

Introduction:—Messrs. Saru Smelting and Refining Corporation were established in the year 1939 by Messrs. Seth Jugmandardas Shital Prasad Jain, Managing Proprietors of the firm who had a long experience of dealing in Non-ferrous Metals and Alloys in India ever since the beginning of this century.

Manufactures:—They manufacture:—(1) All grades of Antifriction Bearing Metal suitable for bearings of Motor Cars, Oil Engines of all descriptions, Petrol Engines, Air Compressors, Diesel Engines, Water and Steam turbines, Air Craft Engines, Locomotives, Electric Generators and Dynamos, Rolling Mills, Textile and Saw Mills, Sugar Mills, Jute Mills, Rice Mills, Paper Mills, Flour Mills, Ginning Machines, Crushers, Shaft Bearings, Lifts, Centrifugal Pumps etc., and other bearing metals of any specification as per the order of the customer.

(2) Tin Solder of all compositions and specifications suitable for every branch of industry.

(3) Brazing Solder of every description.

(4) Silver Solder of all composition and specification.

(5) Brass Ingots.

(6) Gun Metal Ingots.

(7) Phosphor Bronze.

(8) Admiralty Navy Bronze.

(9) Metal Plastic Ingots.

(10) Bell Metals for any specific purpose.

(11) Aluminium Ingots.

(12) Type Metals.

(13) Chill Cast Solid Round and Square Bars from Brass, Gun Metal and Bronzes.

Besides, they undertake all sorts of smelting and refining job of Non-ferrous Metals.

All their products are carefully analysed in their Laboratory before they are put in the market with the result that "Saru" products are to-day well known in the market and have always been in great demand both by the Public and the Government.

Future Outlook:—Their aim is to embrace all branches of the non-ferrous industry and as soon as circumstances permit, they hope to begin production of Sheets, Bars, Rods, Tubes, Wires etc.

The Scindia Steam Navigation Co., Ltd.

Managing Agents: Messrs. Narottam Morarji & Co. *Office*: Scindia House, Ballard Estate, Bombay. *Calcutta Office*: 100, Clive Street, Calcutta. *Works*: Scindia Shipyard, Mazagoan, Bombay '10. *Telephone*: *Bombay Office*: 30075, *Cal. Office*: Cal. 5264, *Telegrams*: JALANATH.

Introduction:—This enterprising Indian firm laid out a large shipyard at Vizagapatam for the construction of steamers upto 8000 tons deadweight. Most of the machinery required such as punching and angle-sharing machinery, plate-straightening machinery, pneumatic and other machine-tools, cranes etc., had been obtained from the U. K. but further progress was delayed by the war taking a serious turn. Early in 1942, several mine sweeprs and basset trawlers were built at Vizagapatam. Owing to enemy action in April, 1942, their activities in Vizagapatam were suspended and under instructions from Government they had to remove their machinery to Bombay where a new shipyard was fitted up for shipbuilding and repair. Towards the end of 1942, however, work was re-started at Vizagapatam and a ship-yard was laid out with necessary facilities for ship-repair and construction work with machinery brought from Bombay.

Activities:—The Scindia Steam Navigation Co., Ltd., are the biggest Swadeshi concern having a fleet of 22 steamers. They have a regular cargo service between India, Burma and Ceylon and a passenger service between Rangoon and the Coromandel coast ports.

The Scindia Company are also running the Haj service from Calcutta, Bombay and Karachi to Jedda and have built two new steamers specially for that purpose. They are also the Managing Agents of the Ratnagar Steam Navigation Co. Ltd., whose vessel plies between Bombay and Panjim on the Konkan Line. They have Branch Offices and Agencies at all the principal ports of India, Burma and Ceylon.

Messrs. Shaparia Dock & Steel Co., Ltd.

Managing Director: Mr. M. B. Shaparia. *Office*: Sewree Fort Road, Bombay. *Works*: (*i*) Parel Road, Byculla Goods Depot, Bombay 12. (*ii*) Sewree Fort Road, Bombay. *Telephone*: 61275 and 60897, *Telegrams*: SHAPARIA.

Introduction:—This Company has emerged in its present form as a result of amalgamation of Messrs. Shaparia Iron & Steel Works Ltd., with Messrs. Shaparia Dock & Engineering Co. This new Company is carrying on the work previously carried on by Messrs. Shaparia Iron & Steel Works Ltd., at the Byculla workshop. The Workshop previously belonging to Messrs. Shaparia Dock & Engineering Co., has now been taken over by this firm and greatly expanded for the manufacture of ships, life-boats etc.

The Byculla workshop was started by Mr. B. P. Shaparia in 1902. It was a modest beginning then. The work undertaken consisted for the most part of constructional nature on a very limited scale. The first big job undertaken by the founders was for the manufacture of corrugated steel pale fencing for the Bombay Municipality. The enterprise had to face many difficulties in the beginning but the confidence and energy with which the promotors pushed on with the scheme gave them complete success.

Later Developments:—During the 1914 war, the Company offered its services to the Government and undertook the manufacture and supply of war stores to the Government. In 1924 the Company expanded its business with the result that it was converted into a limited company. The first big work undertaken by this new institution was the manufacture and erection of large storage tanks each with a capacity of one million gallons. In addition to this the manufacture of paint making machinery was undertaken. The Company also undertook structural work of major importance in the city of Bombay.

In 1935, in order to cope with the increased activities of the Company the premises were extended and suitable plants for manufacturing ambulance, copperload boats, fire fighters, pressed steel-load boats, road watering trucks, hydraulic

tippings as well as 3-way pressed steel boats and pleasure boats for power and manual operation were installed.

In the year 1939, the scope of the business was further widened and the Company opened a department for the manufacture of steel rolling shutters, steel windows, and doors etc. These were fitted to numerous buildings in and around Bombay, and up-country towns, where they are still giving very satisfactory service. One Service Department of the Company looks after the up-keep and repair work throughout the city of Bombay.

Owing to the declaration of the war and the heavy demand of the Government, the Company had to expand its factory still further to two and a half times its pre-war capacity.

Present Position:—Many important works undertaken by the firm have become known for their durability. In addition to all types of iron and steel construction works, the Company produces several specialities of which the most notable is the Shaparia pressed steel boat, an unsinkable craft designed for use with oars or detachable outboard motor. Constructed entirely of pressed steel plates, this boat is leak-proof, rust-proof and cannot warp. A portable fire-proof garage with floating doors entirely climate-proof and embodying many unique features, is also manufactured by the Company.

The Sewree Workshop was started during the period of the war for the manufacture of medium size sea-going vessels and lifeboats, puntoons, trawllers etc. This workshop has now been greatly expanded and the new Company of Messrs Shaparia Dock & Steel Co., Ltd., is launching upon schemes of further expansion.

Shree Hanuman Steel Rolling Mills Co., Ltd.

Managing Director: Mr. K. D. Jalan. *Office*: 8, Dalhousie Square, Calcutta. *Works*: Ghusury, Howrah. *Telephone*: Office: Cal. 4492, Works: Howrah 282, *Telegrams*: SOORATRADE.

Introduction:—The idea of establishing this Company was mooted out by the promoters of the firm when the recommendations of the Tariff Board were published and setting up of re-rolling industry in India, hitherto unknown in the country, was envisaged. It was, however, sometime before the scheme could be finalised with the result that when the firm came into being one or two such firms were already established in Calcutta.

Activities:—They are engaged in rolling from scrap and from billets, imported and indigenous. At present they manufacture rounds of all sizes from $\frac{1}{2}$" to $\frac{1}{8}$", flats upto $\frac{3}{8}$" thick, rails, rods, and bars. Their plan is to undertake manufacture of the unusual varieties also in due course. They have also manufactured Baling Hoops of the best quality which were very much appreciated by the customers.

Shree Jam Wire Products Co., Ltd.

Managing Agents: Messrs. Gor & Co., Ltd., Jamnagar. *Office*: Mherwan Building Sir P. M. Road, Bombay. *Works*: Jamnagar. *Telephone*: 20529, 21554, *Telegrams*: NANDVADAN, Jamnagar, JAMWIRE, Bombay.

This company was started in 1942 with a paid up capital of Rs. 17,00,000 and is engaged in the manufacture of Wood Screws, Office Pins, Gem Clips, Rivets and other wire products.

Messrs. Sind Iron & Steel Works Ltd.

Proprietor: Seth Tara Chand K. Gupta. *Office & Works*: West Wharf Road, Karachi. *Telephone*: 2430 and 2165, *Telegrams*: METTICO.

Manufactures:—They are re-rollers of Iron and Steel into hoops, flats, rounds, squares etc., besides being manufacturers of agricultural implements.

Messrs. Singh Engineering Works Ltd.

Managing Director: Sardar Indra Singh, M.E., F.R.S.C. (Lond.) *Office & Works*: Kalpi Road, Cawnpore. *Telephone*: 2951, *Telegrams*: SINGH.

Introduction:—The firm of Messrs. Singh Engineering Works was started in the year 1920 by Sardar Indra Singh who is considered to be the founder of steel re-rolling industry in India. Starting with a small workshop they rolled their first steel from unserviceable rails in 1927. In 1938 a large factory was acquired and the Singh Engineering works came in the front line of steel rollers in India. It was at this time that they started manufacturing railway truck materials for the Government of India.

The firm was changed into a Private Limited Company in the year 1941.

The works at present comprise of:—

(1) Rolling Mills (2) Machine Making plants and (3) An up-to-date foundry.

Manufactures:—The Singh Engineering Works Ltd., manufacture mild steel, B. S. S. rounds and squares and flat bars from 5/16″ diameter to 3″, Railway Truck Materials, Tie Bars, Cotters, Two-way Keys, Straightening Bars, Crow Bars, Gibs, Chisels, etc., etc.

They undertake cast iron and steel castings of all kinds, manufacture municipal watering and sanitary carts, boats, ornamental gates and railings 1/8″ thick and structural works, tanks, etc.

The machinery manufactured by them are old metal stoves, jewellers rolling materials, agricultural machinery and sugar mill machinery *viz.*, cane crushers, crystallisers, sugar centrifugal, filter presses, driers, lime juice tanks, bag-fillers, *gur* melting pans etc.

They also manufacture door borings, and chimney ovens, tent pins, joints, and pegs, and all materials of the engineering and hardware required by the military units etc.

Sokhey Industries.

Proprietors: Mr. S. Balwant Singh Sokhey. *Office*: P. O. Box No. 64. *Works*: Sultanwind, P. O. Box No. 56, Amritsar. *Telegrams*: CHITRA.

The firm was started in the year 1943 and is engaged in the manufacture of electrical fans, fractional motors, all kinds of electrical appliances, and cycle parts. It also undertakes pig iron castings.

The Star Iron Works.

Proprietor: Mr. Prithwipati Singha. *Manager*: Mr. J. N. Sinha. *Office & Works*: Lillooah, Howrah. *Telephone*: Howrah 289, *Telegrams*: PRITHWIPAT, Lillooah.

Introduction:—The Star Iron Works was established in the year 1916 as a small iron foundry mainly for the manufacture of cast iron cooking pans which were till then being entirely imported from abroad.

Later Developments:—Later when their activities expanded further plots of land were purchased and extensions carried out. A small Machine and Fitting shop was also added to the works. Gradually it has developed into a self-contained factory containing—

(1) *A Perfect Foundry*—Ferrous and Non-ferrous suitable for general Engineering purposes, both Light and Heavy, Simple and Complex, as a Feeder, and

(2) *A Standard Engineering Workshop* comprising a Machine and Fitting shop, a Smithshop as the second Feeder and an Electroplating shop as a final Finisher.

The existing patented process of the Foundry introduced by the founder Mr. Satish Chandra Singha, the 'Foundry Lion' was also improved and a second 'Grant of Patent' for the same was obtained.

Present Position:—The factory at present consists of the following 14 departments all of which are very well equipped:—

1. General Office.
2. Engineering Section including Drawings.
3. Stores Godown and Stockyards.
4. Power House, both Steam and Electric.
5. Foundry (Ferrous and Non-ferrous) including a Patternshop divided into:—
   (*i*) General Casting—Light & Heavy.
   (*ii*) Fishnet Weights etc.
   (*iii*) C. I. Pan Section.



Mr J N Sinha
Manager
Star Iron Works
Lillooah

6. Smithshop.
7. Light Structural and Sheet Metal Works.
8. Welding Shop (Gas and Electric).
9. Machine Shop.
10. Fitting Shop.
11. Electroplating Shop.
12. Weighing Machine Department.
13. Painting & Packing Section.
14. Maintenance and Repairs Section.

The Factory employs a total of about 700 male and female workers.

Manufactures :—The Factory is registered in the list of Indian Stores Department, for supplying different types of light and heavy castings, forgings, machine-finished, fitted-up and electroplated parts. They manufacture Weighing Machines, Weighbridges, Small Tools etc.

All their products are branded with "Star".

Activities :—The firm has all along been a regular supplier to the Calcutta Improvement Trust for different types of castings, cast iron pipes, and specials to B. S. S. They have rendered some very useful and significant services to a number of engineering and chemical firms, contractors and builders in the supply of various types of castings, C. I. sanitary fittings, tanks and containers etc.

The Star Metal Refinery.

Proprietor: Seth Motichand Shah. *Office*: United India Building, Sir Pherozshah Mehta Road, Fort, Bombay. *Works*: Vikhroli, Bombay. *Telephone Office*: 23391, *Works*: 87327, *Telegrams*: STARMETAL.

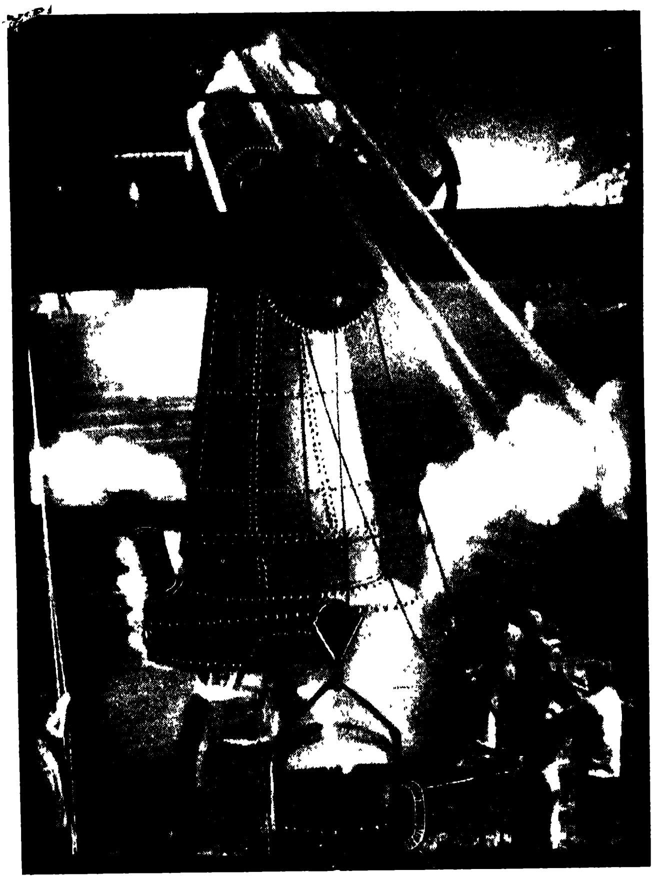
Introduction:—The Star Metal Refinery was started in the year 1940 for the manufacture of Antimony from Antimony Ore (Stibnite). The plant and the furnaces were erected in 1940 and their factory for the first time in India produced Antimony in finished state from indigenous sources though at a slightly high cost.

Present Position:—The capacity of the present plant is three to four hundred tons of Antimony per year which is about the total consumption in India.

By-products like Antimony Oxide, Antimony Sulphide, Golden Sulphate of Antimony and some antimonial salts are directions in which further development is under active consideration of the mangement.

Developments:—They have recently put up a new kind of furnace known as 'Shaft Furnace' which is expected to work very efficiently and bring down the cost of extraction considerably. The distance of the mine in N. W. F. P. from the factory in Bombay has meant considerable mining and transportation cost to the industry. The management have, therefore, in mind a scheme to develop hydro-electric power at the mines and to work the mines mechanically and bring down the ore by aerial ropeways. They have also a plan to concentrate the ore at the mines and bringing the concentrate to Bombay to minimise the transport cost. A good thorough road link between the mines and the railhead will further bring down cost of production.

Conclusion:—India has been exporting away her valuable ores only to get back finished metals at a very high cost. This Refinery is an attempt to prevent this state of things. Now that the industry has been granted protection this important unit of the non-ferrous industry is sure to stabilise itself.



Cupola—"The Heart of the Foundry"

Star Iron Works, Lilooah



Heavy Casting Section
Star Iron Works, Lillooah

The Steel & General Mills Co., Ltd.

Managing Agents: Messrs. Narang Brothers & Co. *Office*: 3, Montogomery Road, Lahore. *Works*: Moghalpura, Lahore. *Telephone*: 4257, *Telegrams*: STEELMILLS.

The Steel & General Mills Co., Ltd., are one of the most important re-rolling mills in India. The Company possesses an excellent mill and a 5-ton Electric Furnace.

It is one of the 'A' class re-rolling mills and had been established much before the war broke out. It manufactures ordinary bars and flats in the rolling mill. There is also a steel foundry which is served by the Electric Furnace.

The Steel Equipment & Construction Lt

Managing Director: Mr. D. C. Dhiman. *Office & Works*: 22, Grand Trunk Road (North) P. O. Lilooah, Dist. Howrah. *Telephone*: Howrah 399, *Telegrams*: STEELQUIP.

Introduction:—The Company was started in the year 1929 with a small capital of Rs. 12,500/- for the manufacture of steel furniture of all varieties. Later it was converted into a limited company.

Later Development:—In 1935 they took up the structural, mechanical, welding, and galvanising work and executed many important contracts.

In 1938 they planned the manufacture of cutlery also but owing to the outbreak of the war they closed down this department and in its place started a re-rolling mill to re-roll iron rounds, plates and angles etc.

During the war, the Company was mainly engaged in the manufacture of war materials such as T. G. Shed, Nissen Twin Shed, Angles, Pickets, P. & T. Tubes, parts of Armoured Vehicles, Bath Ovals etc.

In 1941, the Company got assistance from Government in acquiring about 11 bighas of land at 22, G. T. Road, Lilooah and shifted the factory to the present site.

Future Plans:—The Directors of the Company have recently converted the company into a Public Limited Company. They are thinking of importing up-to-date machinery from England and America with a view to manufacturing various kinds of materials for the civil market. The following are some of the items which the management have under consideration for the post-war period :—

1. Structural work of public buildings.
2. Railway Jobs.
3. Chaff-cutter blades, knives, etc.
4. Locks, Hinges, Staples, and other iron and brass materials for building purposes.

The Steel Products Ltd.

Managing Agents: Messrs. D. Khaitan & Sons, Ltd. *Office*: 9, Clive Street, Calcutta. *Works*: 96, Garden Reach, Calcutta. *Telephone*: *Office*: Cal. 577, South 2410, *Telegrams*: ADEQUATE.

Introduction:—Started in 1914 by an American firm it was acquired by the late Mr. D. Khaitan who held highest number of shares in the company in 1938. Since then it has been under the management of Messrs. D. Khaitan & Sons Ltd.

The war of 1939 afforded them a great opportunity to expand their activity when they manufactured various components for armoured fighting vehicles,. The number of workmen employed rose from 100 to 700.

Manufactures:—The Steel Products Ltd., manufacture *inter alia* the following:—

Steel Furniture and Office Equipment, Steel Racks Cabinets, Steel Doors and Windows, Steel Chimneys, Steel Tanks pressed and rivetted, bolted or welded; Steel Staging, Steel Structure of all kinds, Sugar Mill Machinery, Cane Carriers, Centrifugal Dryers and Tanks, Jute Mill Machinery, Tea Cutters, Tea Sorters, Tea Packers, Tea Dryers.

For the future they have a very ambitious programme of mechanical and structural engineering as well as of several new lines of manufacture.

The Structural Engineering Works Ltd.

Managing Agents: Messrs. Bhagat & Sons, Limited. *Office*: Prospect Chambers (2nd Floor) Hornby Road, Fort, Bombay. *Factory*: Sewri, Fort Road, Bombay. *Telephone*: *Office*: 30167, *Works*: 60445, *Telegrams*: STRUCTURAL.

Introduction:—It was started in 1921 as a proprietory concern under the name and style of Messrs. Bhagat & Sons. Since then it has undergone vast changes in equipment and shifted from one place to another a number of times before finally emerging as the Structural Engineering Works Ltd.

At its new premises at Sewri, it has a big workshop, with one of its sheds of unique welded design consisting of welded stanchions and welded arch-ribs. This is believed to be the first structure of this kind in India.

Large Structural Works Undertaken:—The first large order for welded steel-work executed by them was for the new extension of the Bombay Electric Supply & Tramway Company's Building at Colaba.

Sometime later, an order for about 600 tons of steel-work was received from the East Indian Cotton Association for their new premises at Kalbadevi. In this structure, welded steelwork was adopted as far as possible, and some of the girders used are believed to be carrying the heaviest loads ever carried by such structures in India. This work was carried out in record time under the most adverse circumstances. The building is believed to be one of the highest in India.

Soon after, the order for steel work for the Brabourne Cricket Stadium was received and the work was carried out very expeditiously. This stadium is the largest, East of Suez, and the steelwork is welded throughout.

The firm has done the steel work for a school building for the Hunsraj Pragji Thakersey Girls High School in Bombay, where on account of the spacious hall necessary, three 60′-0″ span lattice girders, all of welded construction and 15′-0″ deep

have been erected. This is supposed to be the first of its type in India.

They have also completed the steelwork for the extension of the Times of India Building, where a suspended floor 300′-0″ x 50′-0″ is provided, without intermediate supports.

Steel work for extensions of textile mills and steel framed buildings, aeroplane hangers, station roofs etc., are being handled. Welded steel boiling Kiers are also made by this firm, and they have supplied these to many textile mills all over India.

Conclusion :—A competent technical staff is employed and designs of all kinds of structures, often with special features, are undertaken.



Mr. R. N. Sharma
Orient Safe Manufacturing Co., Ltd.
Calcutta

The Swadeshi Industries Ltd.

Managing Agents: Messrs. Anandram Gajadhar. *Office*: 100, Netaji Subhas Road, Calcutta. *Works*: P. O. Panihati, 24 Parganas. *Show-room* 158, Cross Street, Calcutta. *Telephone*: *Office*: Cal. 2469, *Works*: Barrackpore 31. *Telegrams*: JAIPURIA, Calcutta.

Messrs. Swadeshi Industries Ltd., are manufacturers of backelite electro technical goods like switches, cut-outs, plugs, plug sockets, tumbler switches (plain), tumbler switches (with fuses), ceiling-roses etc.


POWER AFLOAT
Lister

The Tata Iron & Steel Co., Ltd.

Managing Agents: Messrs. Tata Sons Limited. *Head Office*: Bombay House, Bruce Street, Fort, Bombay. *Agents' Office*: 102-A, Netaji Subhas Road, Calcutta. *Works*: Jamshedpur. *Telephone*: *Head Office*: 26041, *Agent's Office*: Cal. 4477, *Telegrams*: *Head Office*: IRONCO, Bombay, *Agents' Office*: TATAIRON, Calcutta, *Works*: IRONCO, Jamshedpur.

Introduction:—With the advent of the present century there opened a new chapter in the industrial history of India in as much as Iron and Steel Industry in the modern sense of the term made its first appearance on the Indian scene and a new chapter was opened in the industrial annals of India by the late Mr. Jamshedji Tata, Visionary, and yet a Realist, whose name towers above any other name in Indian Industrial History, and whose career reads like a romance of industry.

The pioneering efforts, the early failure and the ultimate triumph of the House of Tata is a familiar tale. Jamshedji died on the 19th May, 1904, after preparing the ground and sowing the seeds which later blossomed into the Tata Iron and Steel Co., which was formed in 1907 and commenced the actual construction of the work in 1908 in a jungle between the Suvrenarekha and the Khorkai rivers in the District of Chhota Nagpur in Bihar. Tata Iron & Steel Works are situated at Jamshedpur which was originally known as Sakchi. The first pig iron was produced in 1911 and the first steel in 1912.

The Company has its own Ore Mines at Noamundi in Bihar and at Gorumahisani, Badampahar and Suliapat in the State of Muyurbhanj in Orissa, at distances ranging between 40 and 80 miles from Jamshedpur, and its Collieries some 105 to 110 miles away. The other raw materials required for making Iron & Steel, like fluxes and refractories are also available within easy distance.

The First World War (1914-18):—The original plant consisted of two Blast Furnaces and a Steel Plant with rolling mills and had an annual productive capacity of 120,000 tons of pig iron and roughly 80,000 tons of rolled steel.

In August, 1914, the war broke out. In order to feed the Allied War machines, it became essential to mobilize the entire resources of the Empire. The most pressing demand was for steel, a metal ever supreme in the front line of defence. To Tata Works came an opportunity to strengthen the production front of the Allies. Inspite of its infancy it supplied about 300,000 Tons of steel rails etc. to Government at a concessional price which helped the war effort to a great extent. In recognition of this service, to honour the founder Jamshedji Tata, Lord Chelmsford renamed the place, Jamshedpur and the nearest railway station, Tatanagar.

Period of Trial and Fiscal Protection:—On the 11th November, 1918 came the victorious end of the war for the Allies. The world returned to normal ways of living. The war had given a great fillip to India's industries in general. But the period of prosperity did not last long. The process of transition from war to peacetime conditions involved considerable suffering. An economic slump with its essential concomitants, unemployment, poverty, and misery soon swept over the whole world. The Indian steel industry with its reserves almost completely depleted during the war, found itself on the edge of a precipice with its roots exposed to the blizzard of war competition. In accordance with the recommendations of the Fiscal Commission, the Government granted protection to the Steel Industry in 1924, partly by import duties which were first reduced in 1927 and again in 1934, and partly by granting subsidies which were removed in less than three years of their grant. Protective Duties were due to expire on 31st March 1941 but the Government decided to continue the same for reasons of War.

The protection referred to above was not a burden on the consumers. In the case of Iron & Steel, the additional revenues accrued to Government from protective duties on rolled steel, excluding Government Stores, amounted to Rs. 10.35 crores during the period 1924-25 to 1937-38, whilst the value of protection to the Steel Company over the same period came to Rs. 8.89 crores. The figures speak for themselves.

The first years of protection were difficult for the steel industry. Dumping accentuated by the depreciation of the

Continental exchanges, the disastrous labour strike of 1928 at the Works of the Company, fall in the steel prices, a progressive drop in the orders for rails and the acute economic slump that followed the Wall Street crash in 1929, created a precarious situation.

The Era of Expansive Prosperity:—The grant of further protection in 1934 coincided with a new era of prosperity. Seizing the opportunity, the Steel Company went ahead and spent during the period of seven years a sum of Rs. 8.1/2 crores on its development programme including the erection of New Control and Research Laboratories equipped with the latest appliances for process control and research. Production grew from year to year reaching record figures in 1941-42. Further extensions were contemplated, some of which were completed inspite of the out-break of the war in 1939. A new thousand-ton Blast-furnace replaced one of the old furnaces in 1939-40. A plant for the production of Railway Wheels, Tyres and Axles, so vital to the scheme of the Railway Board for the large-scale manufacture of locomotive engines in India and to the self sufficiency of the country in the supply of rolling stock was installed and brought into operation in November, 1941. An additional steel-making plant and a 50-ton Acid Open-Hearth Furnace were put into operation in June, 1942, increasing the ordinary steel-making capacity of the plant and turning out acid steel from Indian materials for locomotive forgings, acid boiler plates, railway rolling stocks etc. A new Benzol, Toluol Plant was installed and brought into operation on behalf of the Government in May, 1941. A half-ton High-frequency Furnace for the manufacture of special alloy steel was put into operation in September, 1943. A pilot ferro alloy plant with four electric arc furnaces for the production of ferro-tungsten was installed in April, 1943. A Vanadium extraction plant is in progress. The Steel Company also proposes to set up an entirely separate department for the manufacture of alloy and tool steels in the near future.

The Steel Company had also formulated before the outbreak of the war proposals for the installation of a Billet Mill to roll billets suitable for several types of small and medium forgings; a hoop and strip mill, and a tube mill in co-operation with Messrs. Steward & Lloyds. As priority had to be given to

other extensions of more immediate importance from the point of war, these plans have had to be held in abeyance.

The Second World War (1939) :—The second great world war demanded more and more steel. The foresight displayed by the Steel Company in building its new Control and Research Laboratories in 1937, placed it in a position in which it could render immediate assistance to Government. In September, 1937 Tatas offered to place for the duration of the War their entire resources at the disposal of the Government.

As the war wore on, possessing the necessary experienced personnel, equipment and research organisation, Tatas embarked on an elaborate research programme which enabled them to manufacture and supply in addition to large quantities of structural products and carbon steel, a wide range of special and alloy steels as well, for the fabrication of the armoured vehicles, for armour-piercing and high explosive shells, for gun carriage mountings, for ship-building, for service helmets, for parachute harness equipment, for machine tools, mint dies and surgical instruments and for a variety of other requirements. The ability of Messrs. Tata Iron & Steel Co., Ltd., to manufacture special alloy and tool steel is not only of great importance to the allied war effort, but will, without any doubt, play an important part in the post-war industrial development of India. A number of essential industries—from aircraft, automobile, locomotive and machinery production down to cutlery, engineering and hardware manufacture—depend for their maintenance and growth on a continuous supply of tool and alloy steels. It is hoped that by assuring them of such supplies, the Company will be able to carry the country many stages forward in the direction of self-sufficiency.

The Tata Iron & Steel Works undertake all operations from the production of pig iron to the manufacture of finished steel, producing pig iron, steel ingots, rails, fishplates, steel sleepers, structural sections, bars, plates, sheets, steel wheels, tyres, and axles for railways, and agricultural tools. Byproducts are coal-tar, sulphate of ammonia, zinc dross, flux skimmings, red oxide and ferrous sulphate. Associated companies which are located round about the Tata Steel Works produce tinplates, rods, wire, wire-nails, bolts and nuts, electric cables, steel-mill rolls, castings

etc. The pre-war production of pig iron and saleable steel amounted to about 1 million tons and 700,000 tons per annum respectively. With the schemes of extension contemplated by the Company the production of finished steel is expected to go up to about 950,000 tons per annum.

The Company also administers the town of Jamshedpur. The administration of the town, with all the comforts and amenities afforded for the work people, costs the Company half a crore per year. Where a few years ago a little jungle village named Sakchi was situated, to-day there stands the city of Jamshedpur with a population of 1,50,000 built up around the Tata Iron & Steel Works.

Conclusion :—Tatas aim at both industrial and humanitarian ends. They have set up an industry which may be regarded as the keystone of the industrial arch. Appreciative of human values they are endeavouring their utmost for the promotion of labour welfare. Starting with modest beginnings, they have grown to be the largest single steel-producing unit in the British Empire and served, in the war, as the largest single arsenal east of Suez. Their role in the post-war development of India will, doubtless, be of great significance, for steel which helped to win the war, will help no less to build the peace.

The Textile Machinery Corporation Ltd.

Managing Agents: Messrs. Birla Brothers Ltd. *Office*: 8, Royal Exchange Place, Calcutta. *Works*: (1) Belgharria (B. & A. Rly.), (2) Gwalior State. *Telephone*: Cal. 562, *Telegrams*: TEXMACO, Calcutta.



Introduction :—The Textile Machinery Corporation Ltd., was incorporated on the 4th August, 1939, with a paid-up Capital of Rs. 25,00,000 to manufacture cotton textile machinery and parts. It began operation in 1941 with an initial programme of producing 250 spinning frames and 2,000 looms annually which was, however, upset by the war.

It has two factories; one at Gwalior and the other at Belgharria (Bengal); the former is now working on textile machinery while the latter was diverted during the war to produce war material. The value of the plant and machinery at the end of 1942 was about Rs. 18,50,000. The Calcutta factory has now been geared on to the production of textile machinery.

Present Position :—The capacity of the Textile Machinery Corporation which is one of the pioneers in the line and can be considered as representative of the industry in the country, is about 2,000 looms and 100,000 spindles per year. This capacity could be increased many

times over, if precision machine tools along with other equipments are made available.

Their Gwalior branch working with only a small part of their original machinery imported for the purpose is engaged on a programme of manufacturing 1000 looms per year. The manufacture of spinning frames is still in a preparatory stage.

Conclusion:—One of the long felt difficulties of the textile industry, cotton, jute, silk and woollen is that it has to depend on foreign countries for the fabrication of textile machinery and parts with the result that in times of crisis like war its efficient working and expansion are seriously hindered. The establishment of the Textile Machinery Corporation, therefore, fills an important gap in the industrial economy of the country.

Tin Printing & Metal Works Ltd.

Managing Agents: Agarwal Bros., Ltd. *Office & Works*: Grand Trunk Road, Subzimandi, P. O. Birla Lines, Delhi. *Telephone*: 5645, *Telegrams*: TIN.

Introduction:—Tin Printing & Metal Works Ltd., Delhi was incorporated as a public limited company in the year 1934 with the principal object of manufacturing printed and decorated tin containers of all descriptions and sheet metal goods.

The working of the Company started in 1937 as it took a long time to import suitable plant and machinery.

Manufactures:—Soon after starting the work and before the Company could be established on proper lines, the World War Second broke out in 1939 and the Company had to switch off its energies to meet the needs of the Defence Department. During war the Company enlarged its workshop to produce mechanical parts, hand tools and other engineering stores required for its own consumption as well as to meet the requirements of the Defence Services. Tin Containers, Patches Folding Boat, Hollow-ware, Cooking Utensils, Receptacles, Buckets, Tubs, Kettles, Hot Water Appliances, Steel Trunks, Suit Cases and many other articles made of light metal sheet and cast material were produced and supplied in bulk for use by the army during the war and are now available for civil consumption.

Present Position:—During the war the Company, inspite of various handicaps, made additions to the building, plant and machinery. It now consists of Ferrous and Non-Ferrous Metal foundry, Galvanizing, Tinning, Electro-Plating, Tin Printing, Lacquering by Photo Litho Process, Acetaline Welding, Manufacturing of Electrical Appliances and Precision Tools and Agricultural Machinery.

United Iron & Steel Corporation Ltd.

Managing Director: Mr. K. N. Dalal. *Office*: 9, Clive Row, Calcutta. *Works*: 119, Grand Trunk Road, Belur (Howrah). *Telephone*: Howrah 936, *Telegrams*: BUYERS.

Manufactures:—They manufacture Tanks, Drums, Cisterns and Cylinders. They also take interest in trunking for Ducts and Steel Metal Work plain or galvanized.

The Universal Screw Factory.

Proprietor: Seth Dharmavir Virmani. *Office & Works*: Chheharta (N. W. R.), Amritsar. *Telephone*: 482 Amritsar, *Telegrams*: UNISCREWFY.

The Universal Screw Factory came into existence as an individual proprietory concern in 1941 with a capital of Rs. 300,000 owned entirely by Indians. The first set of machinery were imported from Hongkong. Further additions in the equipment had to be carried on in the workshop itself on the Hongkong model.

For some time they worked with brass and manufactured brass screws only. Later, they started manufacturing iron screws as well and executed numerous orders from the Supply Department, Railways, and from some Government factories engaged in essential war work. In 1943 the entire production of the factory was reserved for the Director-General, Munition Production, Calcutta.

Items of Manufacture:—The Universal Screw Factory manufacture M. S. Wood Screws, Brass Wood Screws, Machine Screws and Rivets. At present they manufacture about 150,000 wood screws per day. They can easily increase their output to 500,000 screws per day.

Labour:—The factory employs about 175 workers half of whom have some sort of technical training.

Usha Bolt & Nut Co.

Proprietor: Mr. Bhimji Palan. *Office & Works*: Khandelwal Bhawan, 5, Hanspukur Lane, Burra Bazar, Calcutta. *Telephone*: B.B. 5074, *Telegrams*: USHANYAY.

The Company was started in 1946 with a capital of Rs. 2 lacs. It is engaged in the manufacture of Bolts, Nuts, Hook bolts, Crack Bolts, Structural fittings, Containers and machinery parts etc..

Messrs. Vasant Industrial & Engineering Works.

Managing Proprietor: Mr. K. H. Shah, M.Sc., M.I.T., B.T.E. *Office & Works*: Vasant Vijaya, 470-71, Worli Road, Bombay 10. *Telephone*: 41037, *Telegrams*: ASTRONOMY.

Introduction:—The Vasant Industrial & Engineering Works were founded in the year 1939 with 3 to 4 welding sets and about as many lathes. In 1940, most of the work was concentrated on the manufacture of textile, dyeing, bleaching and finishing machinery. Later in the year 1942-43, the work of manufacturing chemical plants was also taken up.

Manufacture:—To-day the Firm is undertaking the manufacture of the following lines:—

(1) Textile Engineering:—Bleaching, dyeing, printing and finishing machinery, industrial humidification, air-conditioning refrigeration, oil refinery.

(2) Electro chemical plant for chlorine etc.

(3) Oil refinery for vegetable ghee plant.

(4) Manufacture of chemical plants, machinery for match, paper and other miscellaneous industries.

According to the special requirements of clients, specifications are drawn up by a group of engineers on the basis of which machines are built by the firm.

The machines manufactured by the concern are first tried and tested on production in their own establishment before they are sent out. They are at an average manufacturing 10 to 12 machines per month.

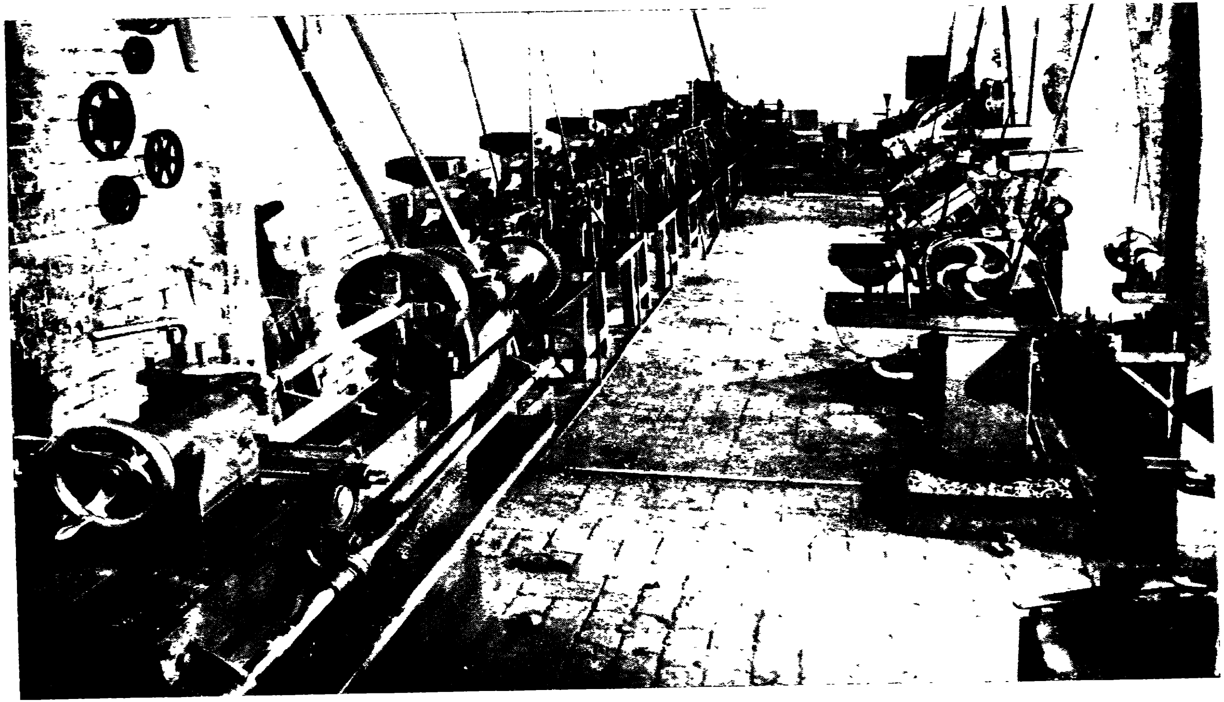
Fabrication of machinery is also taken up by them, according to standard requirements.

As Consulting Engineers:—The works are equipped with highly qualified engineers who also act as consultants regarding industrial plans.



Heading Shop

Victor Industries, Amritsar.



General View
Slotting & Screw cutting Shop.

Victor Industries, Amritsar.

Allied services in the structural, carpentry and masonry and other lines are made available for their clients by the firm.

The Firm is making steady progress and has under its employ about 300 workers of which about 230 are skilled hands.

Victor Industries.

Managing Partner: Mr. Gian Singh Hunjan. *Office & Works*: Sultan Wind, Amritsar. *Telegram*: WOODSCREW.

Introduction:—Victor Industries were formed early in the year 1943. The firm erected a well equipped workshop and then fabricated Woodscrew and Machine Screw Plants in their own workshop. Soon after they pushed their "VICTOR" products in the market.

Items of Manufacture:—Messrs. Victor Industries are at present manufacturing the following:—

1. WOODSCREWS. All kind of Brass and Iron with C. S. K. and Round Heads and from 1/2″ to 2″ in length with witworth and B. A. Threads.
2. MACHINE SCREWS. All kind of Brass and Iron with Round, C. S. K. Chease and Hexagonal heads, from 1/8″ to 1/4″ in width and from 1/4″ to 2″ in length.
3. RIVETS. All kind of Mild Steel and copper with flat, Round and boss snap and Pan heads.
4. EYE HOOKS. All sizes and gauges.
5. PANEL PINS. All kind of panel pins from 1/2″ to $1\frac{1}{2}$″ in length and from 16 to 20 in numbers.

Present Position:—The firm is producing approximately 500 gross of Woodscrews, 100 gross of Machine screws, 5 Cwt. of Rivets, eye hooks and panel pins etc., per day. They can easily increase their production to 1,000 gross of Wood-screws, 300 Gross of Machine screws and 10 cwt. of Rivets, Hooks and panel pins etc. per day without any addition of machinery to the present plant.

Future Outlook:—They are manufacturing more plants *to increase their production of Woodscrews etc.*

Their products are sold under the Trade Mark "VICTOR". The firm is registered as one of the Government Approved Contractors at New Delhi and with the N. W. Railway at Lahore. They are also trying to convert their partnership concern into a Private Limited Company. The management have under consideration many schemes of improvements in the line. One of these improvements is to shave the heads of screws after which it will be difficult to find any difference between foreign and indigenous screws. They have also under consideration the import of machinery from foreign countries to increase their production with a view to decreasing the cost.

The Victory Engineering Works.

Proprietors: Mr. B. S. Gupta. *Office & Factory*: 40, Tangra Road, Calcutta. *Telephone*: Cal. 797.

Introduction:—The Victory Engineering Works were started in the middle of 1911 in response to the demand created by the war.

Activities:—They undertake sheet metal fabrication, all kinds of welding and light structural work.

During the war, their factory was exclusively engaged on war work and their firm was registered as approved contractor to the Department of Supply for the supply of component parts for armoured vehicles.

Their present lines of manufacture are steel furniture, steel security equipment etc.

W. Leslie & Co.

Office: Clive Buildings, 8, Netaji Subhas Road, Calcutta.
Telephone: Cal. 1034 and 4984, *Telegrams*: METALS.

They are the representatives of Messrs. Kamani Engineering Corporation Ltd. who are one of the principal manufacturers of machines tools in the country.